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Minister for Agriculture.

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THE POLLINATION OF PEAR BLOSSOMS.

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INTRODUCTION.

Among the many problems in fruit culture, is the question of the various causes contributing to the refusal of the fruit trees to set their fruit, a condition generally known as "non-setting." It is frequently noticed that some varieties of fruit trees under variable conditions and climates, regularly set good, and often heavy crops of fruit; while other trees are noted for their failure to produce fruit in any noticeable quantity at all. Again, when the same variety of fruit tree is planted in varying latitudes, or even in different countries, it develops entirely diverse characteristics; being a heavy "cropper" in one location, and a "non-setter" in another. There may be various agencies tending to such results; but one of these undoubtedly is the failure of one or several organs of the flowers to perform their natural functions.

THE BOTANY OF THE FLOWER.

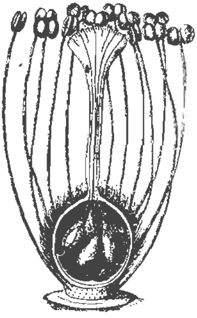
The flower is that portion of the plant which is set apart for the production of the seed. The fecundative or reproductive organs of the flower are almost invariably in the centre of the flower structure, and they are surrounded by (*a*) the calyx, or the outside envelope of the flower, which is generally green in colour; and (*b*) the corolla, or the coloured portion of the flower, which acts as the inner envelope. The reproductive or sexual organs are the stamens and pistil.

The stamens are generally called the male organs. They are often very numerous, as in the eucalyptus flower; while frequently they are regular in number, often being six, eight, or ten. The stamens have a slender stem, on which is carried a variously sized, bag-like organ, which is known as the anther. In the anther are immense numbers of very small white, brown, or yellow, dust-like grains, known as the ***pollen***. This pollen may easily be brushed off, and observed by the naked eye.

The pistil is generally in the centre, and it may either be whole in formation, as in the lily; or it may be subdivided into various sections, according to the variety of species—in pear flowers, the pistil is divided into five divisions. The tip of the pistil is generally enlarged, or expanded, and this portion is known as the *stigma*. The stigma is the first reproductive organ to be developed. While the stigma is often fully developed before the flower opens, the anthers open at various times; and it may generally be noticed that both opened and unopened anthers are existent on the flower at the same time. Thus, a constant supply of pollen is available for the flower, or for other flowers.

POLLINATION AND FERTILIZATION.

The office of the stigma is to receive, on its surface, the pollen grains from the anthers; and it is ripe for this purpose, either when the surface is clearly rough or hairy, or when it is moist or glutinous. These conditions vary in different species of flowers. When the pollen is received on the stigma, the act is known as *pollination*. The pollen there germinates or sends a very fine tube through the pistil into the centre of the young or embryo fruit, where the young seeds or ovules are placed. The pollen tube there impregnates or fertilizes the ovules, and these ultimately become ripened into seeds. This action is known as *fertilization*. Thus, pollination may take place, but unless fertilization results, the action is useless.



FLOWER OF CISTUS: SEPALS AND PETALS REMOVED.

The stamens have their anthers in contact with the stigma. The pollen tubes are shown passing down the style and entering the ovules.

Pollination may take place by the pollen naturally falling on the stigma; it may be blown there by the wind; or it may be carried from flower to flower, by the agency of bees, moths, and other insects. If fertilization does not occur after the lapse of its natural time, the whole flower simply drops off the tree.

LIMITATIONS.

It is thus shown that, before a tree can "set" its fruit, the act of fertilization must inevitably happen; either a flower must be fertilized by its own pollen, which act is called self-fertilization, or it may be fertilized from the flowers of another tree, in which case the operation is termed cross-fertilization. There are limitations to this action, and to results; and they must be taken into account when considering the question. It is undoubted that when cross-fertilization occurs, much finer and better fruits result, than when self-fertilization occurs. Waite found, in his experiments, that in self-pollinated fruits, the tendency of the fruit was always to be smaller, while the largest fruits were always the result of crosses. Thus, to carry pollination and fertilization to a thoroughly successful issue, it is necessary to "cross" the stigmas with pollen from other varieties. There is a limitation here, owing to the variability in the times of flowering; and the choice of the operator, for commercial fruit production at any rate, is limited to crosses between

fruits that blossom exactly at the *same* period of time. Then there is the question of the power of the pollen. It is certain that the power of the pollen is frequently limited, and in two directions; (*a*) the pollen may be sterile in operation on its own variety; or (*b*) it may be sterile on different species. Some fruits are known to be self-sterile, sometimes permanently, and sometimes only according to climate or locality, or under certain conditions. Victorian growers are familiar with this peculiarity in such pears as Winter Nelis, Keiffer's Hybrid, and Gansel's Bergamot. Yet it is well known that, in some localities and countries, even these fruits are self-fertile.

The following varieties of pears are considered to be self-*sterile* in America, according to Bailey:—Beurré Anjou, Beurré Clairgeau, Beurré Superfin, Frederick Clapp, Gansel's Bergamot, Howell, Louise Bonne of Jersey, Souvenir du Congrês, Wilder, Winter Nelis, Williams' Bon Chrêtien.

The following varieties, according to Bailey, are considered self-*fertile* in America:—Beurré Bosc, Beurré Deil, Buffam, Flemish Beauty, Le Conte, Keiffer's Hybrid, Brockworth Park, Seckle, Tyson

It is eminently brought forward by these two lists that environment and climate must modify, or even completely change the action of the pollen; as in Victoria, no trouble generally is anticipated in the setting of the fruits on such varieties as Beurré Clairgeau, Howell, Souvenir du Congrês, and Louise Bonne of Jersey. But what is most amazing is the fact that Keiffer's Hybrid is in America considered self-fertile. It is abundantly known that, in Victoria, it is generally impossible to induce this tree to produce even a fair crop without the aid of cross-pollination; while very frequently it happens, that without artificial aid, the trees of this variety never bear fruit at all.

There are also various contributing causes, which, supposing every other condition be satisfactory, prevent successful cross-pollination. Thus, while it is known that the wind is a regular conveyor of pollen, although only to a slight degree, yet if the direction of the wind be away from the trees, a number of flowers will receive no "cross" pollen at all. Rainy weather at the time of blossoming is also known to interfere very largely with cross-pollination. Then, as Bailey suggests, it is probable that pollen is more profuse and more active in some seasons, than in others.

WEATHER NOTES.

During observations conducted at the Burnley orchards this season, the weather was exceptionally and continuously wet.

The first pear to blossom was a Chinese "quince" pear which was in full bloom on 12th September. The last pears in full bloom were two varieties called "Nashir," a Japanese variety, and "Golden Drop," which were in full bloom on 16th October; and which completed the blooming period on 29th October. From 27th to 29th September, over 300 varieties, out of a total number of 342 varieties of pears, were in full bloom. This was probably the result of the excessive heat experienced on 23rd September; as a number of pears, which were blooming simultaneously during this period in 1910, were not concurrent in bloom in 1905 and 1908.

NATURE'S METHOD—THE BEE AND THE BLOSSOM.

On 26th September very heavy rain fell; and, with only four days' fine weather at various intervals, rain continued up till 12th October. It will thus be noticed that constant rainy weather was experienced during the whole of the main blossoming period.

INSURING CROSS-POLLINATION—ASSISTING THE BEE.

The trees during the past season carried an exceptionally heavy crop of blossom, yet the total crop of fruit set on the trees is a very medium one. There are possibly two reasons for this. The wet weather

interfered with the pollen action; it is generally considered that the effect of the rain is to wash away the pollen, so that it could not reach the stigma of the flower. This theory of rain washing the pollen away requires further evidence, before it can be accepted as final, as the rain would greatly disturb and knock about the flowers, and there should be a better chance of the pollen reaching the stigma than in still weather. Further, it is almost certain that the pollen, becoming excessively moistened with the rain, would be damaged or rendered inoperative, as it is known that wet or moist conditions will cause the pollen grain to germinate and issue its pollen tube. Thus, if the pollen grains germinate prematurely, it must follow that, even if these grains reach the stigma, they will have lost any fertilizing power they may previously have had. The second reason for a light setting of bloom in wet weather is the fact that moths, bees, wasps, and other insects are unable to carry out their regular visits to the flowers under rainy conditions.

Relation of Insects to the Work of Cross-Pollination.

There can be no doubt that insects play a most important part in the life of plants and flowers. Moths and wasps, bees, and many other insects, all assist in carrying the pollen from flower to flower; but of all insects for this purpose, the bee is assuredly the most useful. The first object the bee has in visiting a blossom is to collect or feed on the flower honey or nectar; which is always *lower* in the flower than the pistil or stamens. In passing through the flower the pollen grains attach themselves to the numerous hairs on the body of the bee, and as the insect flies from flower to flower, it is easy to conceive that some pollen grains will be transferred, as the bee brushes against the stigma. The same result occurs when the bee is gathering the pollen; and thus every flower that the bee visits must be pollinated from other blooms. The usefulness and the importance of this work of the bee can hardly be over-estimated; and successful orchard practice will never result, until the work of the bee is recognised practically by the establishment of bee colonies in every orchard district. A very valuable article on the subject of "Bees and Fruit Fertilization," by Mr. R. Beuhne, was published in the *Journal* for November, 1909, and it should be read in conjunction with this article.

Darwin's Laws.

In concluding his remarkable experiments on this subject, the great naturalist Darwin laid down various laws of nature, which are accepted and recognised as final. His results were, first, that self-fertilization tends to weaken the resultant offspring; second, that crossing between different plants of the same variety, grown under different conditions, or in different places, gives better results than crossing between plants grown in the same place or under similar conditions; and third, that, as a general rule, flowers are constructed to favour cross-fertilization. And his renowned declaration is that "Nature abhors perpetual self-fertilization."

Full Period of Bloom.

It is so far seen, that, to gain success in cross-fertilization, means successful, or at least improved fruit crops. Thus, in pears, a grower must *grow more than one variety of pear*; and the question then arises as to the times of blooming of the different pear trees. For it would be fatal

were varieties of pears to be planted that were not coincident in their time of blooming. As a result of observations, it is possible to lay down a general rule, as to the most useful varieties blooming at similar periods, for the purpose of cross-pollination. It is not necessary to have the time of *full* bloom of each variety coincident, as pear trees are in flower from two or three weeks, according to the situation and climate. Observations taken this season, in September and October, 1910, show that in an ordinary orchard situation, a pear tree's average time of bloom, from first to last, is about nineteen days; while, in sheltered locations, the time is extended to from four to six days longer.

PEAR TREES IN BLOSSOM AT BURNLEY.

The following table shows the full period of bloom of fifteen pear trees during the season 1910:—

Variety.	First Flowers.	Full Bloom.	Last Flowers.
Winter Nelis	September 24	September 30	October 12
Urbaniste	" 24	" 30	" 13
Gansel's Bergamot	" 24	" 31	" 17*
Packham's Triumph	" 23	" 28	" 13
Winter Bartlett Chrétien	" 24	" 30	" 17*
Williams' Bon Chrétien	" 24	October 1	" 14
Jargonelle	" 24	September 28	" 12
Uvedale St. Germain	" 24	" 29	" 14
Winter Cole Congrès	" 24	" 28	" 10
Winter Cole Congrès	" 24	" 28	" 16*
Souvenir du Congrès	" 23	" 29	" 9
Glou Morceau	" 24	" 30	" 15
Beurré Capiaumont	" 23	" 29	" 13
Beurré Dell	" 24	" 30	" 13
Mother (Cole's)	" 25	" 29	" 16

* These trees were partially sheltered and protected by large ornamental trees, which were growing on the side from which the rain came. The sheltered position thus prolonged the time of blooming.

FLOWERING TIMES OF PEAR TREES.

To ascertain the times when various pear trees at Burnley were in bloom, observations were made by two of my predecessors. A partial census was taken in 1905 by Mr. C. B. Luffmann, and another in 1908 by Mr. J. Cronin. This season, 1910, a complete census was compiled, and the three observations provide very useful data in connexion with cross-pollination. While it is not claimed that inter-pollination is the sovereign remedy for every case of non-setting of fruit, there is no doubt, whatever, that the crop may be very considerably increased, and that trees may be made to bear by studying this question, and by planting varieties whose bloom periods are concurrent. It is generally recognised that Kieffer's Hybrid, Gansel's Bergamot, and Winter Nelis, are the worst offenders among pears for non-setting in this State, while Williams' Bon Chrétien or Bartlett comes a very good second. The following tables show the various useful pears that bloomed concurrently with these four varieties in the Burnley Orchards, as far as the records were taken:—

Pears Blooming at the same Time as Williams' Bon Chretien.

Variety.	1908.	1910.
Williams' Bon Chretien	October 7	September 30
Beurré Capiaumont	" 7	" 29
Josephine de Malines	" 7	" 26
Choisleau	" 7	" 28
Madame Cole	" 7	" 28
Glou Morceau	" 7	" 30

Pears Blooming at the same Time as Kieffer's Hybrid.

Variety.	1908.	1910.
Kieffer's Hybrid	September 22	September 24
Le Conte	" 22	" 24
Monchallard	" 30	" 24
St. Michael Archangel	October 5	" 24
Harrington's Victoria	" 2	" 24
Broompark	" 2	.. 24

Citron des Carmes is also accepted as a synchronous blossomer with Kieffer's Hybrid, but this pear was lost from the Burnley collection some years ago, and was not replaced till 1910.

Pears Blooming at the same Time as Gansel's Bergamot.

Variety.	1905.	1908.	1910.
Gansel's Bergamot	October 19	October 7	September 30
Beurre Deil	" 19	" 2	" 30
Glou Morceau	..	" 7	" 30
Winter Nelis	October 19	" 2	" 29
General Todleben	..	" 7	" 29
Leopold the First	..	" 7	" 29
Madame Treyve	..	" 7	" 29
Mother (Cole's)	..	" 7	" 29

Pears Blooming at same Time as Winter Nelis.

Variety.	1905.	1908.	1910.
Winter Nelis ..	October 19	October 2	September 29
Gansel's Bergamot	" 19	" 7	" 30
Beurré Deil ..	" 19	" 2	" 30
Bakehouse's Bergamot..	" 19	" 2	" 28
Beurré Rance	" 19	" 2	" 28
Chaumontel ..	" 19	" 2	" 28
King Edward..	" 19	..	" 28
Seckle	..	October 2	" 29
Souvenir du Congrès	..	" 2	" 29
Vicar of Winkfield	..	" 2	" 29

The following list gives the dates of bloom of the principal pears grown in Victoria, and should prove useful to those who wish to replant or re-work their trees, so as to have simultaneous blossoming. The dates given in the preceding, and in the following tables are the times when the trees are in full bloom, that is, when practically every flower was in blossom. They may be compared for the full period of bloom with the table given under that heading:—

Variety.	1905.	1908.	1910.
Bakehouse's Bergamot..	September 19	September 28	October 2
Bergamot, Gansel's	October 19	October 7	September 30
Beurré d'Amanalis	" 12	" 2	" 28
Beurré d'Anjou	..	" 2	" 29
Beurré Capiaumont	..	" 4	" 29
Beurré Clairgeau	..	" 2	" 24
Beurré, Brown	October 26	" 7	October 4
Beurré Deil ..	" 19	" 2	September 30
Beurré, Easter	" 19	" 2	" 26
Black Achan	" 19	" 2	" 26
Bon Chrétien (Williams')	..	" 7	" 30
Brockworth Park	October 9	September 24	" 20
Broompark ..	" 19	October 2	" 24
Buffam	..	" 7	October 4
Conseiller de la Cour	October 12	" 30	September 25
Glou Morceau	..	" 7	" 30
Harrington's Victoria	..	" 2	" 24
Jargonelle ..	October 12	" 2	" 28
Josephine de Malines	..	" 7	" 26
Kieffer's Hybrid	..	September 22	" 24
Le Conte ..	..	" 22	" 24
L'Inconnue ..	October 26	October 7	October 4
Louise Bonne of Jersey	..	" 2	September 26
Madame Cole	..	" 7	" 28
Marie Louise	October 2	" 7	October 5
Monchallard	..	September 30	September 24
Mother (Cole's)	..	October 7	" 29
Neverfail ..	..	" 2	" 27
Seckle ..	..	" 2	" 29
Souvenir du Congrès	..	" 2	" 29
St. Michael Archangel..	September 30	October 5	" 24
Triomphe de Jodoigne	..	" 2	" 26
Twyford Monarch	..	" 2	" 26
Uvedale's St. Germain	..	" 2	" 29
Vicar of Winkfield	..	" 2	" 26
Winter Cole ..	..	" 7	" 28
Winter Nelis ..	October 19	" 2	" 29

It will be seen from the above list that the various pear varieties are fairly regular and consistent in their bloom periods. The tables show that the year 1908 may be taken as an average season; while in 1905 the trees blossomed late, and in 1910 they flowered early. This is the general rule; but a glance at the list shows a few variations, and the list of the whole varieties shows the same. This list must not be taken to be thoroughly suitable for the whole State, as change of latitude may change the regular time of flowering of any variety.

CONCLUSIONS.

One reason for the non-setting of fruit has thus been set out; and it is evident from the data given, that it is clearly possible for a fruit-grower to remedy this. Two facts definitely stand out, and if these are observed and adopted successfully, there is no doubt that the result will be increased fruit production. The first is that cross-pollination and cross-fertilization cannot possibly be carried out unless more than one variety of pears be grown; and also that the blossoming of these pears must be simultaneous. The second is, that bees are essential to successful results; and therefore that every orchard tree should be within easy reach of bee colonies.

Where at present only one variety of pear is grown, or where the varieties do not concur in their time of blooming, it is necessary that other varieties should be introduced. To replant occasional rows, or individual trees scattered through the pear area, would mean continued loss for several years. A quicker method would be to work over, by grafting on to the present trees, a scion of a second distinct variety, working only one leader of the tree; grafting only every second or third tree. Or occasional trees may be wholly worked over with the new kind.

As a temporary and immediate expedient, a jar containing water may be placed in the crown of the tree, when the tree is in flower, and in this some sprays of another variety of pear bloom may be placed, so that the second variety will be there for the action of the bees and other insects. This is shown in the illustration. The tree in the illustration is the variety "Autumn Prolific," raised by the late Mr. J. C. Cole. Although called prolific, it is not a heavy producer; yet, as a result of the action of cross-fertilization the tree has set a good crop this season; and in comparison with neighbouring trees, a heavy one.

Bailey, in his work on *The Principles of Fruit Growing*, advises that the safest practice in planting, is to plant no more than two rows of any one variety together, in fruits which, like many apples and pears, self-sterility is often apparent. Large blocks of the same variety of fruit should never be planted, unless it has been definitely decided that the flower is self-fertile, and is therefore capable of bearing the best possible crop, unaided by cross-pollination.

STERILITY IN FRUIT TREES.

E. Wallis, Inspector, Vegetation Diseases Acts.

The subject of this article is one of several problems now receiving attention from the Orchard Inspection Branch. With a view to solving the vexed problem of sterility in fruit trees, Mr. P. J. Carmody, Chief Inspector of Orchards, some time ago requested the district inspectors stationed in the different fruit-growing centres of the State to make observations and take notes of any factor favourably influencing, or operating against, the setting of fruits. It is recognised that a solution of such a problem as that under notice can be arrived at only by careful and systematic observations and experiments under the many varied conditions, such as climate, soil, aspect, inter-pollinating influence by pollen from fertile trees, and the habit of growth, including spur formation.

Varieties Affected.

That certain kinds of fruit trees are prone to barrenness is well known, in fact, this infertility or self-sterility although partially affecting many kinds may, to a great extent, be looked upon as a varietal characteristic. In Victoria, such kinds as Kieffer's Hybrid and Winter Nelis pears, Northern Spy apple, Coe's Golden Drop plum, and Early Purple Guigne cherry are notable as very shy or, in some cases, non-bearers. This has, unfortunately, been the experience of many growers in this and other States—experience that has been made tedious by long years of patient waiting for the trees to end their profitless, and commence their profitable, career. They have, as a rule, remained either completely or almost barren, despite the fact that they have, to use common parlance, been "white over with blossom" year after year. There are exceptions where these varieties have done well in the matter of fruiting and, on the other hand, instances are not rare where trees, even of good bearing varieties, are known to be duffers. It is, however, safe to say that contributing causes may usually be found such as will be explained subsequently.

Causes of Sterility.

At first thought, this fact—that varieties may be self-sterile—looks strange; but it would not so appear were we to study thoroughly the conditions governing the undesirable quality, for it is like all other effects due to some specific cause or causes, which, if defined, open the way for remedial treatment. Realizing this, the writer has made special observations during the present season in the Diamond Creek and Bacchus Marsh districts of various factors essential to the fertilization of blossoms.

The first and most important detail in connexion with this vital process is perfection in the structural arrangement of the flower organs, for if there be any imperfection here sterility or partial sterility is likely to be the natural result. As a case in point, the writer found at Mr. A. C. Simon's orchard, Bacchus Marsh, an apple tree—a seedling—which Mr. Simon had planted fifteen years ago, but the tree had never fruited. Recently, when visiting the orchard, the writer was asked the cause of barrenness and upon examining the blossoms, the reason was very evident, for they were found to be totally unisexual, with the pistils entirely missing. Thus, through this imperfection, sterility was the natural result. Although, in this singular case, the cause was so marked it was not so with the great majority of the other trees examined. The blossoms of a large number of trees of Kieffer's Hybrid pear, Coe's Golden Drop plum, Early Purple Guigne cherry and others were examined carefully, but no imperfection was found to exist; in fact, the stigmas of a large percentage of the blossoms were found to be self-pollinated, despite which no setting took place.

It was quite singular, in some cases of sterile trees, to observe how plentiful was the supply of pollen even when the stigma was in a receptive condition. With reference to this aspect of the subject Inspector Hammond, of Doncaster district, writes—"The result of a careful examination of the carpels, anthers, stamens, pistils, and stigmas of the "shy" varieties was of a negative character, and up to the present time I cannot account for their infertility. An examination of the flowers of the different kinds of trees which failed to set their fruit did not disclose any defect in the essential organs of reproduction." Inspector Farrell (Evelyn district) states—" I have not been able to detect any obstruction

in the pistil tubes, except in cases such as the sudden dying off of the stigma as, for instance, the Marie Louise pear, before the pollen was ripe. This is not so noticeable in other kinds, but it occurs to some extent."

Thus it is obvious that, although in some rare cases there may be an underlying cause of sterility or partial sterility owing to some malformation of the reproductive organs of the flower, speaking generally, there is not enough irregularity here to warrant our fixing it as a common cause of the trouble.

In looking elsewhere for the cause one is struck with the fact that most of the kinds classed as "shy" or "non" bearers are usually those growing uprightly and vigorously (therefore densely) such as Kieffer's Hybrid pear and Northern Spy apple, or those producing an over-abundant number of spurs, and consequent amount of blossom, as in the case of Winter Nelis pear, Coe's Golden Drop plum, and Early Purple Guigne cherry. It is a well-established fact that upright and vigorous growth on the part of a tree is diametrically opposed to fruitfulness, but in the case of the Kieffer pear it cannot be said that it does not make the attempt to bear, for it generally blossoms heavily. Therefore, it would appear that this over-abundant blossoming on the part of several varieties may be a predisposing cause to sterility by weakening the pollen to the extent that it becomes impotent upon its own pistils.

Inspector Davey, of Geelong, states—"I think trees exhaust themselves when they have a very profuse show of blossom. This has been very marked this season in Winter Nelis pear and Coe's Golden Drop plum, both of which trees were *all* blossom, and yet both have set badly. This may be caused by each of the flowers trying to set fruit, and also by the tree being unable to feed all of them. They therefore abort because their struggle for existence is so even. Sometimes, when a flower is slightly more favourably situated, it sets and then we have a tree carrying a few solitary fruits."

There is also another aspect of the question, and that is the fact that some trees, although there may be nothing abnormal in their habit of growth or spur-production, may be self-sterile. Bailey says in his *Survival of the Unlike*, p. 247—

Since the demonstration of the value of sprays for exterminating the insect and fungus enemies of fruits the most important advance in American pomology is the discovery that some varieties of fruit are unable to fertilize themselves.

And on p. 349 the same authority writes—

The pistil or seed-bearing member refuses to accept the pollen from the same flower or even from any flower on the same plant; or, to transpose the statement, the pollen is impotent upon its own sisterhood of pistils.

In the case of trees of good bearing varieties proving to be barren the cause is likely to be hereditary. Probably, the tree, from which the ones in question were worked, was sterile or partly so. Therefore, all the trees produced by buds or grafts taken from the original one would reproduce its characters, the law that "like begets like" being very aptly illustrated. We may thus summarize the position as to the primary causes of sterility as follows:—

1. Imperfection of structural arrangement of blossom.
2. Unfruitful habit of growth and over-production of fruit spurs and blossom.
3. Natural impotency of pollen.
4. Working by buds or grafts taken from sterile or partly sterile trees.

REMEDIES FOR STERILITY.

Taking the summary of direct causes, as stated, imperfection in the structural arrangement of blossom is, in the case of a tree such as that mentioned, generally a recurring trouble that cannot be remedied. No time should therefore be wasted with such a tree. If the stem is sound it might be worked over with a variety of good repute.

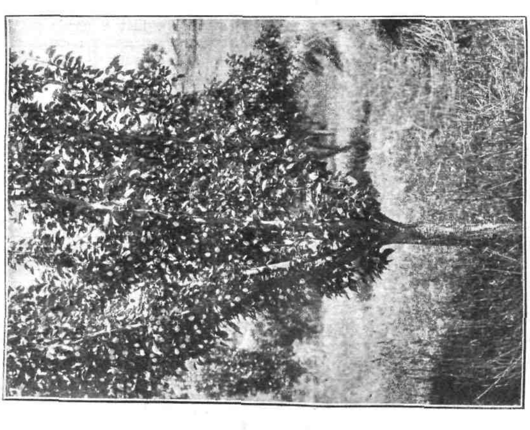
In regard to the unfruitful habit of growth and over-production of spurs good results may sometimes be obtained by adopting proper methods of pruning both of wood and spurs. In the matter of spur-pruning, Winter Nelis has responded well to this treatment which has been adopted by the writer. Inspector Hammond states—"With Winter Nelis and Gansel's Bergamot, I have noted that thinning out the spurs caused the fruit to set."

Inspector Cock, of Bendigo, in referring to this matter, writes—"A good average crop of pears has set throughout the district, Williams' Bon Chrêtien being the heaviest, with Winter Nelis and Gansel's the lightest. This is due to a large extent to allowing too many buds of a weak and depleted character to remain, and pruning off all light laterals. Where bud arrangement has been carried out, and laterals allowed to remain, good crops of Gansel's Winter Nelis, and, in fact, all varieties have set."

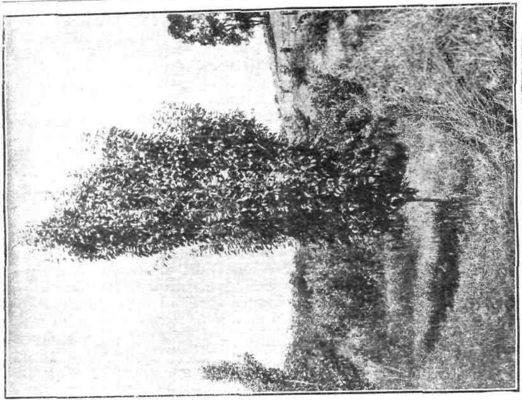
In regard to Kieffer's Hybrid pear, its general habit of growth is diametrically opposed to fruit-bearing, being very vigorous and upright. At Eltham, and also at a few orchards in the Diamond Creek district, the soil conditions make for weakly growth on the part of this variety. As a consequence of the weakly and rather spreading habit of growth, this otherwise sterile pear fruits splendidly, in fact, better than most kinds. It is, however, almost impossible to bring this condition about by pruning when the soil is favourable to strong growth in Kieffer and when the tree has not been worked out from time of planting.

We have, however, in this variety of pear, one that responds readily to cross-fertilization. From facts observed, and experiments conducted, it would appear that Kieffer is very receptive to fertilization—not from its own pollen, but from pollen from other varieties of pears, such as Harrington's Victoria, Le Conte and Citron des Carmes. Inspector Hammond states that Poire de Berriays and Monchallard also have a very marked influence upon the fertility of Kieffer in the Doncaster district. Inspector Farrell writes to the effect that Howell, also, is beneficial in this respect in the Burwood district.

During this season the writer has conducted experiments by fertilizing Kieffer blossoms by hand and otherwise with other kinds. The first experiment was carried out at Mr. C. Millthorpe's orchard at Diamond Creek upon a strong-growing tree planted fifteen years ago. Until this season, it has borne only a few odd pears each year, although the tree had always blossomed profusely. It was decided to cross with Harrington's Victoria, a variety raised by the late Mr. Harrington, of Diamond Creek. This variety blossoms later than Kieffer but its early blossoms have developed when the other tree is in full bloom. The experiment was carried out on the 20th September and consisted of placing a kerosene tin, half full of water, in the centre of tree. Three limbs of blossom, with their basal ends in the water, were placed in the tin. The blossoms retained their freshness for days; in fact, some developed while in this position. The result of the experiment was soon evident, for instead of strewing the ground as in previous years, the fruit set splendidly. Plate No. 1 shows

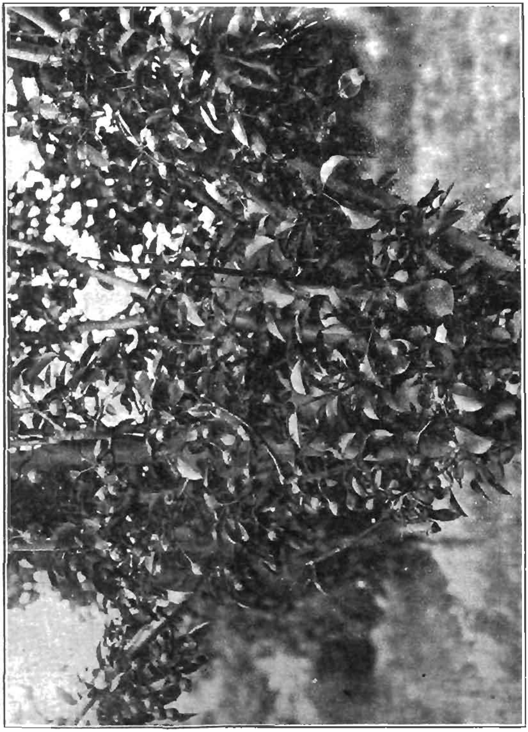


1. PEAR TREE CROSS-FERTILIZED, SHOWING RESULTING FRUIT.



2. ADJACENT TREE OF SAME VARIETY UNTREATED—NO FRUIT.

the setting of fruit on this tree, the photograph being taken on the 30th November when the fruit was somewhat larger than an almond. No. 3 shows a section of the same tree. No. 2 represents a Kieffer tree next to the one experimented upon. It will be noticed that it is growing uprightly, with leaders close together, and is almost fruitless.



3. SECTION OF PEAR TREE ILLUSTRATED IN NO. 1.

Experiments were also carried out at Mr. W. Gray's orchard, Upper Diamond Creek. In this case, Le Conte was used as a cross with three Kieffer Hybrid pear trees which up to present season were unfruitful. The experiment was entirely satisfactory, a first-rate setting of fruit being

the result. Mr. L. C. Brock, of Doreen, has worked Citron des Carmes for pollinating purposes upon his Kieffer trees and thus obtains splendid yields from trees which for years were barren. It would also appear that, with Early Purple Guigne cherry and Coe's Golden Drop plum, cross-fertilization is essential to produce fruitfulness.

Spur pruning in the case of these varieties does not seem to give the results as it does, for instance, with Winter Nelis and Gansel's Bergamot pears. Complaints as to the barrenness of the cherry and the plum mentioned are very general in most places, but in the Diamond Creek district there are several instances where a state of fruitfulness has undoubtedly been brought about by the inter-pollinating influence of other kinds growing near by. At Mr. J. H. Anderson's orchard, Early Purple Guigne bears regularly, being alternated with Black Biggareau, while at Mr. Hollinger's orchard Pond's Seedling appears to exert a beneficial influence upon Coe's Golden Drop plum. In respect to the Doncaster district, Inspector Hammond writes—"The Early Purple Guigne seems to be in need of cross-fertilization. This variety is one of the earliest bloomers and when no other variety blooming at the same time is planted near, light crops are the rule. The varieties which do well in juxtaposition are Biggareau de Mezel, Burgdorf's Seedling and Chapman. The Biggareau de Mezel and Guigne, both shy varieties, are mutually benefited by being planted close together."

Thus, impotency of the pollen from natural causes would appear to be the general cause of the trouble when trees of perfectly-formed blossoms refuse to set their fruit after proper methods of pruning, spur or otherwise, have been adopted. Where this is the case, the only hope of effecting a cure is by cross-fertilization with other kinds—fertile, and blossoming simultaneously.

Where trees are found to be sterile from causes hereditary, the only way out of the difficulty is to re-work by grafting or budding with wood, or buds taken from trees known to be good doers.

In conclusion, it is well to remember that the inter-pollinating influence of some kinds upon others is a factor making for fruitfulness in trees, which has never been recognised as it should have been when planting orchards in the past; for it is quite feasible that, not only are some shy or non-bearers made fruitful by this means, but even fair-bearing varieties may be improved. With reference to this aspect of the question, Bailey remarks—

Much of the failure of apples, pears, and plums to set their fruit even when bloom is abundant, is unquestionably due to too continuous or extensive planting of individual varieties; and it is safe to expect that other fruits are also jeopardized by unmixed planting. This knowledge as soon as it becomes more extensive and exact is sure to modify greatly the planting of orchards.

Therefore, with a desire to assist intending planters when selecting varieties with a view to inter-pollination, the Chief Inspector of Orchards has requested me to compile lists of the different varieties of fruits and their blossoming periods in the districts mentioned as reported by the inspectors stationed in the various fruit-growing centres of the State. This information will be found in the accompanying table. The dates given refer to the full bloom period. In order to arrive at the date of partial bloom an average allowance of from six to nine days should be reckoned.

Dates of Blooming.

Variety.	District. Bendigo.	Diamond Creek.	Doncaster.	Evelyn.	Goulburn Valley and North-East.	Maryborough.	Western.
				Apples.			
Adam's Pearmain ..	28.10	..	..	..	31.10	22.10	..
Annie Elisabeth ..	28.10	6.11	5.11	..	26.10	20.10	..
Autumn Pearmain ..	..	..	..	..	..	..	15.10
Ben Davis	4.10	..	..	26.10	..	..	20.10
Blondin	..	..	..	18.10	..	..	..
Buncombe	28.10	30.10	..	25.10	..	20.10	31.10
Carolina Red June ..	..	..	..	11.10	..	..	..
Cat's Head	18.10	..	..	..	..	..	..
Cellini	..	23.10	..	..	..	..	..
Clayton	..	..	..	..	10.10	..	..
Cleopatra	18.10	..	..	17.10	6.10	12.10	17.10
Commerce	..	..	..	..	..	..	22.10
Cox's Orange Pippin ..	12.10	17.10	..	12.10	..	6.10	..
Craike's Seedling ..	18.10	..	..	..	..	..	..
Delicious	28.10	..	..	..	..	..	..
Devonshire Quarrenden ..	18.10	..	6.10	..	..	..	19.10
Doctor Hogg	..	..	..	..	17.10	..	..
Dougherty	..	19.10	8.10	20.10	..	..	..
Draper's Best	28.10	..	..	..	..	..	..
Duchess of Oldenburg ..	..	8.10	4.10	4.10	9.10	..	..
Dumelow's Seedling ..	14.10	18.10	..	18.10	10.10	6.10	..
Early Margaret ..	..	22.10	..	..	..	..	..
Early Strawberry ..	18.10	..	..	..	..	..	..
Ecklinville	..	..	..	..	..	..	17.10
Emperor Alexander ..	4.10	22.10	17.10	18.10	..	..	..
Esopus Spitzenberg ..	4.10	21.10	19.10	16.10	..	12.10	20.10
Fillbasket (Kentish) ..	4.10	..	..	..	..	..	15.10
Five Crown	28.10	3.11	1.11	3.11	31.10	20.10	7.11
French Crab	18.10	..	..	..	..	..	1.11
Garibaldi	4.10	..	..	..	..	..	..
Gladstone	..	12.10	16.10	..	..	..	..
				Apples—*continued*.			
Golden Russett ..	..	..	..	15.10	..	..	..
Gooseberry Pippin ..	18.10	..	..	..	..	..	16.10
Grand Duke Constantine	..	..	..	18.10	..	..	..
Granny Smith ..	..	..	..	19.10	..	..	20.10
Gravenstein	11.10	16.10	13.10	14.10	12.10	..	..
Green Altriston ..	..	25.10	..	..	..	..	..
Hamilton	..	..	..	..	..	..	9.10
Hoary Morning ..	12.10	..	18.10	..	..	12.10	25.10
Hoovet	28.10	5.11	24.10	..	..	..	5.11
Horn	..	..	..	..	..	..	18.10
Irish Peach	4.10	11.10	..	14.10	11.10	6.10	8.10
John Toon	..	..	..	1.10	..	..	..
Jonathan	18.10	18.10	16.10	17.10	10.10	..	18.10
Kentucky Red Streak ..	1.10	..	..	..	12.10	..	..
Late Wine	..	21.10	..	..	..	..	..
Lever	..	20.10	..	..	..	..	18.10
Lord Lennox	..	..	..	14.10	..	..	..
Lord Suffield	14.10	20.10	15.10	13.10	..	..	..
Lord Wolseley ..	28.10	22.10	..	25.10	..	..	..
Maiden's Blush ..	..	..	..	..	17.10	..	..
Mellon's Seedling ..	18.10	..	..	..	..	12.10	31.10
Merritt's Royal Pearmain	18.10	..	..	..	..	..	..*
Missouri Pippin ..	..	22.10	..	22.10	..	..	..
Moore's Extra ..	..	..	..	..	16.10	..	..
Morgan's Seedling ..	25.10	..	..	5.11	..	..	..
Moss's Incomparable ..	..	24.10	..	..	..	..	..
Munroe's Favourite ..	4.10	10.10	13.10	..	11.10	6.10	11.10
Nickajack	28.10	26.10	..	..	..	20.10	..
Newtown Pippin ..	18.10	..	..	..	..	..	13.10
Northern Spy	26.10	23.10	..	..	19.10	..	1.11
Peasgood's Nonesuch ..	..	20.10	..	25.10	..	..	..

DATES OF BLOOMING—*continued*.

Variety.	Bendigo.	Diamond Creek.	Doncaster.	Evelyn.	Goulburn Valley and North-East.	Mary-borough.	Western.
	APPLES—*continued*.						
Pomme de Neige	24.10	12.10	12.10	16.10	12.10	12.10	..
Prince Alfred	18.10	..	..	7.10	..	..	..
Prince Bismarck	4.10	15.10	..	14.10	..	6.10	16.10
Prince of Pippins	4.10	5.10	..	8.10	..	6.10	..
Red Astrachan	*18.10*	..	..	..	..	..	8.10
Red Cluster	4.10	..	..	..	..	..	..
Reinette de Canada	18.10	21.10	18.10	21.10	22.10	12.10	18.10
Ribston Pippin	4.10	..	12.10	14.10	..	..	9.10
Rokewood	15.10	20.10	25.10	16.10	..	12.10	20.10
Rome Beauty	28.10	5.11	3.11	4.11	3.11	..	7.11
Rymer	18.10	21.10	20.10	21.10	18.10	12.10	26.10
Scarlet Nonpareil	*10.10*	..	..	*4.10*	*12.10*	*12.10*	*20.10*
Scarlet Pearmain	..	..	..	18.10	..	..	..
Schockley	..	23.10	..	..	15.10	..	20.10
Schroeder's Seedling	18.10	..	..	..	15.10	..	..
Senator	..	..	..	16.10	..	..	..
Shepherd's Perfection	13.10	..	..	8.10	10.10	12.10	..
Sherland Queen	..	..	6.10	10.10	..	..	..
Smith's Early Red	..	..	..	*4.10*	..	..	..
Smith's Seedling	..	..	6.10	..	..	..	..
Stansill	18.10	..	..	..	16.10	..	18.10
Statesman	..	..	*22.10*	22.10	..	..	..
Stewart's Seedling	..	..	..	15.10	..	12.10	..
Stone Pippin	18.10	21.10	18.10	22.10	20.10	..	22.10
Sturmer Pippin	13.10	19.10	..	19.10	16.10	12.10	24.10
Williams' Favourite	..	21.10	23.10	22.10	..	..	..
Winesap	..	..	..	..	24.10	..	..
Winter Majetin	28.10	28.10	30.10	25.10	17.10	..	2.11
Yates	*12.10*	*15.10*	*12.10*	*14.10*	*17.10*	*12.10*	..
	PEARS.						
Autumn Bergamot	7.10	..	..	..	..	..	..
Bailey's Bergamot	7.10	8.10	..	7.10	..	..	..
Bakehouse's Bergamot	..	..	..	27.9	..	..	..
Bergamotte Cole	..	..	..	5.10	..	..	..
Beurré Berckman's	..	2.10	..	3.10	..	..	..
Beurré Bosc	7.10	10.10	7.10	7.10	7.10	..	9.10

Variety.	Bendigo.	Diamond Creek.	Doncaster.	Evelyn.	Goulburn Valley and North-East.	Mary-borough.	Western.
	PEARS—*continued*.						
Beurré Capiaumont	7.10	29.9	3.10	3.10	27.9	6.10	3.10
Beurré Clairgeau	*7.10*	28.9	25.9	29.9	1.10	1.10	22.9
Beurré d'Anjou	7.10	..	25.9	..	1.10	..	..
Beurré Giffard	7.10	..	..	..		..	..
Beurré Hardy	7.10	..	..	2.10	..	..	..
Black Achan	29.9	..	30.9	28.9	..	6.10	29.9
Brockworth Park	..	25.9	..	..	..	..	..
Broompark	7.10	29.9	28.9	2.10	..	1.10	..
Brown Windsor	*29.9*	..	..	..	..	..	..
Cattillac	29.9	..	..	..	..	..	..
Clapp's Favourite	..	4.10	..	..	..	..	..
Cole's Hybrid	..	..	25.9	..	..	..	..
Doyenné Boussoch	..	..	30.9	4.10	..	..	..
Durondeau	..	..	27.9	..	..	..	..
Easter Beurré	29.9	..	..	10.9	..	..	..
Elizabeth Cole	..	..	..	28.9	..	..	..
Fertility	..	..	..	28.9	..	..	..
Flemish Beauty	7.10	..	..	4.9	..	..	..
Gansel's Bergamot	7.10	5.10	30.9	1.10	..	6.10	29.9
Glou Morceau	..	..	..	9.10	..	..	..
Golden Beurré	..	..	..	14.10	..	..	..
Harrington's Victoria	..	26.9	20.9	..	..	..	..
Howell	..	28.9	20.9	21.9	..	..	..
Idaho	..	..	..	8.10	8.10	..	..
Jargonelle	29.9	29.9	..	22.9	28.9	1.10	..
Josephine de Malines	*4.10*	*2.10*	..	30.9	*4.10*	1.10	29.9
Kieffer's Hybrid	20.9	20.9	16.9	20.9	20.9	1.10	15.9
Lady Lynn	..	..	..	10.9	..	..	..
Laffer's Bergamot	..	17.10	..	..	..	..	..
Lawrence	..	30.9	..	..	..	..	..
Le Conte	..	26.9	..	..	24.9	..	..
Leon Leclerc de Laval	7.10	7.10	..	..	..	..	..
L'Inconnue	7.10	..	7.10	..	4.10	*12.10*	..
Louise Bonne of Jersey	4.10	..	30.9	..	..	..	..
Madame Cole	..	29.9	..	26.9	..	..	..
Marie *Louise*	*7.10*	..	4.10	*5.10*	..	6.10	5.10
Monchallard	..	..	18.9	..	..	..	..
Mount Vernon	..	..	4.10	..	..	..	..

PEARS—*continued.*

Napoleon	29.9	..	30.9	1.10	..	..	..
Neverfail	..	1.10	1.10	27.9	..	..	..
Poire de Berriays ..	29.9	..	20.9	..	..	..	..
St. Michel	..	..	..	22.9	..	..	..
Souvenir du Congrés ..	29.9	..	..	..	..	..	..
Summer Bon Chretien ..	29.9	..	..	..	..	..	..
Swan's Orange.. ..	..	..	..	4.10	..	..	..
Uvedale's St. Germain ..	7.10	..	..	..	..	6.10	..
Vermont	..	..	..	20.9	..	..	..
Vicar of Winkfield ..	..	5.10	..	..	4.10	6.10	29.9
Williams' Bon Chretien	7.10	12.10	10.10	9.10	7.10	6.10	5.10
Winter Cole	29.9	2.10	2.10	2.10	..	12.10	9.10
Winter Nelis	7.10	3.10	30.9	2.10	29.9	6.10	5.10

PLUMS.

Abundance	..	18.9	..	..	..	..	..
Angelina Burdett ..	..	8.9	12.9	7.9	..	..	..
Black Belgium.. ..	..	..	..	17.9	..	..	..
Black Diamond ..	..	16.9	12.9	16.9	4.10	..	..
Blood	..	..	..	1.9	..	..	..
Blue Belgium	..	21.9	..	..	..	..	..
Burbank	..	8.9	..	12.9	..	..	..
Cherry Plum	..	9.9	..	1.9	..	..	..
Coe's Blue Superb ..	..	14.9	..	..	..	..	..
Coe's Golden Drop ..	..	21.9	20.9	30.9	4.10	..	25.10
Coe's Late Red ..	..	..	..	..	9.10	..	..
De Montfort	..	..	..	25.9	..	..	..
Early Orleans	..	14.9	12.9	15.9	..	..	20.10
Early Red	..	16.9	..	..	..	..	..
Egg Plum	..	..	..	28.9	..	..	..
Golden Gage	..	..	..	28.9	..	..	..
Grand Duke	..	14.9	20.9	27.9	..	..	..
Green Gage	..	27.9	..	30.9	..	..	29.10
Hill End	..	..	..	12.9	..	..	..
Isabella	..	..	..	7.10	..	..	..
Jefferson	..	25.9	25.9	27.9	..	..	..
Late Black	..	..	20.9	..	..	..	..
Late Orleans	..	..	..	3.10	..	..	..
Late Red	..	..	20.9	..	..	..	..
Lawford's Gage ..	..	..	..	20.9	..	..	..
Magnum Bonum ..	..	27.9	25.9	26.9	..	..	..
Overall	..	..	..	23.9	5.10	..	..
Pond's Seedling ..	..	26.9	25.9	30.9	10.10	..	..
Reine Claude de Bavay..	..	22.9	27.9	30.9	..	..	..
River's Early Prolific ..	..	..	..	22.9	..	..	..
Trenowin	..	22.9	..	..	..	..	..
Washington	..	29.9	..	29.9	1.10	..	..
Wickson	..	8.9	..	..	..	..	..

PEACHES.

Belôt's Late Red ..	..	15.9	..	..	..	..	..
Brigg's Red May ..	..	17.9	16.9	8.9	22.9	..	..
Comet	..	..	..	14.9	17.9	..	..
Conkling	..	..	..	10.9	..	..	..
Crimson George ..	..	16.9	..	..	..	..	..
Early Alexander ..	..	14.9	..	..	..	..	..
Early Crawford ..	..	7.9	4.9	21.9	..	..	..
Early York	..	..	..	21.9	..	..	..
Foster	..	..	13.9	..	..	..	..
Hale's Early	..	15.9	12.9	25.8	22.9	..	..
Harrison's Seedling ..	..	20.9	..	..	..	..	..
Jones' Early Red ..	..	18.9	..	..	..	..	..
Late Crawford ..	..	..	1.9	3.9	..	..	..
Lady Palmerston ..	..	7.9	..	21.9	..	..	..
Merri Merri	..	..	..	8.9	..	..	..
Muir	..	..	..	21.9	..	..	..
Perfection	..	..	..	25.8	..	..	..
Prosperity	..	7.9	..	..	..	..	..
Pullar's Cling	..	..	17.9	..	..	..	..
Royal George	..	2.9	5.9	6.9	15.9	..	..
Salway	..	..	20.9	..	..	..	..
Saunder's Seedling ..	..	10.9	..	..	..	..	..

CHERRIES.

Bedford Prolific ..	30.9	3.10	1.10	30.9	2.10	..	30.9
Belle d'Orleans ..	..	25.9	..	..	..	..	..
Bigarreau de Mezel ..		..	24.9	21.9	..	..	..
Bigarreau Napoleon ..	19.9	10.10	4.10	..	4.10	..	30.9
Bigarreau Reverchon ..	30.9	..	..	..	..	..	..
Bigarreau Twyford ..	..	5.10	4.10	1.10	1.10	..	..
Black Bigarreau ..	30.9	25.9	..	24.9	..	6	..
Black Circassian ..	30.9	..	..	..	..	..	..
Black Eagle	..	1.10	..	..	..	..	..
Black Tartarian ..	..	..	..	8.10	4.10	..	29.9
Burgdorf's Seedling ..	19.9	24.9	22.9	19.9	..	..	..
Centennial	..	..	..	..	2.10	..	..
Chapman	..	..	22.9	..	..	..	..
Early Lyons	24.9	29.9	28.9	25.9	26.9	..	24.9
Early Purple Guigne ..	24.9	26.9	22.9	27.9	24.9	..	10.10
Early Rivers	..	..	..	25.9	..	..	29.9
Eagle's Seedling ..	30.9	..	..	..	..	..	..
Florence	5.10	7.10	12.10	7.10	2.10	..	..
Hortense	..	..	6.10	..	..	..	..
Kentish	..	..	..	7.10	..	..	..
Late St. Margaret ..	7.10	10.10	8.10	12.10	2.10	..	29.9
Thiele's Seedling ..	..	..	..	15.10	..	..	..
Waterloo	..	..	..	30.9	..	..	15.10
Werder's	19.9	27.9	23.9	1.10	..	..	10.10
Wilk's Seedling ..	..	26.9	1.10	3.10	..	..	..

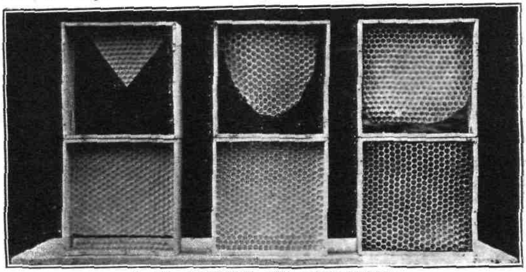
THE PRODUCTION OF COMB-HONEY.

F. R. Beuhne, Bee Expert.

In Victoria, and in Australia generally, the amount of honey marketed in the comb is only a small fraction of the total production. In England, the United States, and Canada, a considerable portion, perhaps nearly one-half, of the honey used for table purposes is in the comb.

In North America, the production of comb-honey in 1 lb sections has attained to large dimensions and many large apiaries are run exclusively for the raising of high grade section-honey, high prices being obtainable for what is graded as "fancy." In the profitable production of comb-honey, considerable skill, and favourable conditions of climate and flora, are essential.

That a larger amount of honey in the comb is not consumed in Australia is often attributed to lack of enterprise of the apiarists, or to the absence of consumers willing to pay the extra price for honey in the comb, as compared with extracted.



1 LB. SECTIONS FOR COMB-HONEY.
Upper tier, from starters; lower tier, full sheets.

The true causes of the small production are, however, the climatic conditions of our country and the vagaries of blossoming and nectar secretion of our native flora. The yields of honey are, perhaps, equal to those obtained in any part of the world, when taken on an average for several years, but our high average is made up of a glut one season and a comparative dearth in the following. We have "on" and "off" years; and, while it is comparatively easy to produce good sections in the "on" year, it would be quite unprofitable to attempt it in the "off" year.

In the case of extracted honey, much of it is held over from one season to another without any deterioration in quality. Comb-honey, however, cannot be kept in perfect condition for any length of time, except with a considerable amount of trouble in providing dry warm storage. Thus, 1 lb. sections may be rather plentiful one season and almost unobtainable the following, and the prices proportionately high. Under these conditions, neither production nor consumption can be expected to increase.

Some ten to fifteen years ago, several apiarists produced comb-honey on a large scale, but abandoned its production for that of extracted honey.

Much of the section honey which finds its way on to the market now is produced by bee-keepers in a small way; and in appearance leaves much room for improvement.

As already stated, considerable skill is required to produce good comb-honey which, judging by the sections seen in shop-windows, and even at shows, is usually absent. Much of the faulty appearance, however, as well as most of the damage comb-honey suffers in transit on the railways, is due to false economy on the part of the producer, who provides the section boxes with only a small starter of foundation as shown in the first section of the top row in the illustration. This section stands on one supplied with a full sheet of the thinnest foundation (12 to 13 square feet to the lb.) and a bottom starter.

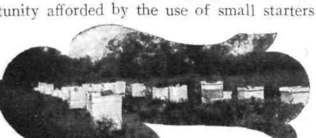
The progress of the work of the bees may be seen in the second and third pair of boxes. The third one of the top row, although almost ready for sealing by the bees, is not fastened to the bottom of the section; while, in the lower tier, the comb is already fastened to the wood all round in No. 2 and completely fills the box in No. 3.

Apart from the quality of the produce, which would be the same in either case, there are two things to be considered in section honey, viz., appearance and weight. A section built from a starter will be partly sealed before comb-building is finished, and the cappings will often loose their virgin whiteness before the sections are ready for removal from the hive. Drone comb is also usually resorted to by the bees; and the finished section has not an even surface, nor is it fastened to the wood all-round, and whatever spaces are left open increase the liability to break down in transit and to deduct from the weight.

When a section is built from a full sheet of the thinnest foundation and bottom starter the bees first of all join sheet and starter, as in No. 2 of the bottom tier. They then raise the comb simultaneously over the whole face and seal or cap it all over at one time, so that, when ready for removal, the capping is snow-white, the section full weight (15 to 16 oz.), and being a solid block of comb completely filling the box will not break down and leak in transit.

It is, however, important that only the thinnest surplus foundation should be used, as stout foundation is objectionable when eating the comb. It should not be less than 12 square feet to the 1 lb. This grade costs 2s. 8d. per 1 lb. which will cut 100 full sheets and bottom starters, or 400 top starters as shown in first section of the top tier. The cost per dozen for foundation would thus be 4d. for full sheets and 1d. for top starters; but as well-filled snow-white sections, such as can only be obtained from full sheets, are worth from 1s. to 2s. per dozen more, there is an actual gain of 1s. to 1s. 9d. per dozen in using full sheets and bottom starters.

There is yet another advantage in the use of full sheets; that is, brood and pollen are not so likely to find their way into the section boxes. When the brood-chamber consists, as it should do, of worker-comb, bees will often build drone-comb and raise drones in the section boxes, when given the opportunity afforded by the use of small starters.



SULPHITING.*

A RECENT FRENCH WINE-MAKING DEVELOPMENT.

F. de Castella, Government Viticulturist.

Within the past few years, the making of the "vin ordinaire" of Southern France has undergone what is little short of a revolution, owing to the introduction of a new wine-making method; if, indeed, the innovation can be dignified by such a term, since it consists of little more than an improved and more general use of sulphurous acid during fermentation, as a means of regularising and controlling this most vital natural process.

Cellarmen have long been familiar with this substance, though not always under the above name. The so-called fumes, produced when sulphur is burnt in air, consist almost exclusively of sulphurous acid or sulphur dioxide, as the gaseous form is more correctly called. Its chemical formula, SO_2, constitutes a convenient abbreviation. The sulphuring of wine, by means of these "fumes," has long been known and often practised, whilst their use for preserving empty casks in sound condition is so universal that sulphur is rightly looked upon as an indispensable substance in every cellar.

In addition to its being sanctioned by centuries of experience, sulphurous acid is one of the few substances, the use of which is authorized by our pure wine and pure food laws; it is, in fact, the only legal antiseptic so far as wine is concerned. The proportion in which it may be used is strictly limited, but legislative restrictions are sufficiently broad to enable ample advantage to be taken of the regularising influence on which the method of using it, now under review, is based. *This presents nothing which is in the slightest degree contrary to either the letter or the spirit of our pure wine laws.*

In the past, sulphuring has been usually confined to the after treatment of wines, and has usually been an exceptional operation—at least in Victoria—or only applied in certain special districts. It is worthy of note, however, that some heavily sulphured wines rank amongst the choicest and highest priced which Europe produces. The new method consists in applying it during and from the very commencement of fermentation. Its action is thus very different from what obtained under former methods, in which it played the part of an ordinary antiseptic.

Sulphuring was formerly confined to white wines. The new system is equally applicable to red or white wines.

NEED FOR REGULARISING FERMENTATION.

In theory, wine-making is an automatic process. Nature has placed the sugar in the interior juice and the ferment, which is to convert it into alcohol, in the bloom, on the outside of the berry. When these are brought into contact, through the crushing of the fruit, the transformation into wine takes place spontaneously, demanding from the winemaker little intervention, beyond seeing to the absolute cleanliness of implements and storage vessels, and separation from solid matters and occasionally rackings at such times as may be found most suitable.

Some of the finest wines the world has yet produced are the result of manipulations as rudimentary as those outlined above. Especially

* Pending the adoption of a more suitable term, a literal translation of the French word ***sulfitage*** must be used. This signifies the use of sulphites, and has been adopted, owing to the fact that the sulphurous acid, which constitutes the basis of the process, is usually added in the form of a sulphite, mainly as bisulphite of potash.

when dealing with small quantities of perfect fruit, and under temperature conditions, absolutely at their best for the proper evolution of the ferment, the happiest results have usually been obtained. When dealing with large quantities, however, conditions are vastly different, and in spite of scrupulous cleanliness faulty wines are occasionally produced. Climate plays an enormous part, and it is worthy of note that it is in the warmer parts of Southern France and Algeria, where climatic conditions are so similar to our own, that the advantages of the new method have led to its very general adoption.

The troubles of the wine-maker in hot climates are not new, and since the very earliest times it has been found possible to evade them, by supplementing Nature in the shape of the addition of certain substances to the crushed grapes, prior to fermentation. Gypsum or plaster proved itself to be a most efficient corrective of faults in composition, as well as a safeguard against fermentation dangers in warm countries. For centuries is has been practically the only corrective used. With its aid it was found possible to make sound wine, whereas without it, faulty wines were of continual occurrence. In ancient Rome plastering was very generally carried out and the practice has until recently been a common one in warm climates.

In addition to its manifest advantages, however, plastering presents the drawback of increasing the proportion of sulphates in the wine. When the French Academy of Medicine limited the proportion of these substances to 2 grammes per litre, calculated as sulphate of potash, a limit reached by the addition of one-third to one-half the quantity of plaster, usually judged to be necessary for safety, consternation was caused in warm southern districts, and very large quantities of faulty wines were made.

As plaster in such reduced quantities exerts scarcely any beneficial purpose on fermentation, its use was discontinued. Several other substances were proposed to take its place which would not alter the composition of the wine to an extent contrary to French legislation; notably bicalcic phosphate and tartrate of lime, neither of which gave results approaching those of discarded plaster. Greater attention was paid to control of temperatures and correction of acidity, where naturally deficient, by the addition of tartaric acid.

Sound wines were once more produced in large quantities, but wine-making could no longer be looked upon as the simple process of former times. Many growers regretted the days when the use of plaster was unrestricted and not a few authorities have expressed opinions opposed to present legislation. Nevertheless, the laws of most countries are now similar to those of France, and, in the case of dry wines at least, plastering is henceforth out of the question. It has never been practised to any extent in Victoria.

This brief historical sketch is necessary to explain the growing popularity of the new method, which is truly phenomenal. Although only proposed a few years back, it is estimated that, during the 1909 vintage, no less than 7 to 800,000 hectolitres (15,400,000 to 17,600,000 gallons) were fermented in Southern France with the aid of sulphurous acid.* Presenting, as it does, all the advantages of plastering without any of its defects it is really not surprising that it should appeal so strongly to wine-makers and bid fair to become the universal wine-making method of Southern France.

* Jean Vidal in *Bulletin de la Société des Agriculteurs de France.* 15 Oct., 1909. p. 264.

HOW THE METHOD BECAME POPULAR.

It is rather surprising that the general use of sulphurous acid did not long ago become popular. The method of white wine-making, known in French as *débourbage* (literally, removal of mud), has long been known and differs but slightly from the one under review. The former has, however, only been applied to white wines, whereas the latter is equally applicable to red or to white.

A description of débourbage or setting, will be found in the translation of Roos' *Wine-making in Hot Climates* (issued by this Department) p. 169. Briefly, it consists in delaying the start of fermentation for a day or two, during which time a sediment, consisting of impurities, albuminous matters, &c., is allowed to deposit. The clear juice after being run off from this sediment is fermented apart, the resulting wine being cleaner and, especially, better in condition than that fermented in the ordinary way, without preliminary separation of impurities. In the case of débourbage, the delay in the start of fermentation is obtained by treatment with sulphur dioxide produced by burning sulphur. According to Roos, the dose necessary to delay its commencement for 18 to 24 hours is .05 grammes per litre of must ($\frac{3}{4}$ oz. per 100 gallons).

Numerous writers have, within the past few years, recommended the freer use of sulphurous acid in wine-making, but to MM. Dupont and Ventre, of the Montpellier School, is due the credit of having brought the use of this well known substance into every day practice. Their experiments in connexion with it have covered a period of about seven years. The articles they have published,* especially the first one in 1906, have drawn public attention to the advantages to be obtained; advantages which have impressed themselves so forcibly on all those who have tried it, as to have led to the astonishing increase in its general application referred to above.

For the greater part of the information which follows I am indebted to the articles of MM. Dupont and Ventre.

ACTION OF SULPHUROUS ACID.

This exerts itself in several ways, but mainly through its antiseptic action on the different micro-organizms contained in the fermenting mass. It has long been known that most of the wine-maker's troubles are due to the development of bacteria. Even defects which only make their appearance months afterwards, are indirectly due to bacterial action during the first fermentation, the presence of which may not even have been suspected at the time. The *mannitic* ferment is, in this way, one of the greatest enemies the wine-maker has to contend against in Northern Victoria. This antiseptic action of sulphurous acid is more severely felt by injurious bacteria than by yeasts. Its presence in the fermenting mass prevents the development of the former, whilst it only slightly retards, and that only at the commencement of fermentation, that of the latter, which are thus permitted to do their work freely and without hindrance, and consequently under the best possible conditions.

Bacteria, though the most dangerous competitors of the alcoholic ferment, are not its only opponents. There are many varieties of alcoholic ferment; some of these, usually known as wild yeasts, are little less objectionable than bacteria. Sulphurous acid hinders the development of these wild yeasts more than that of the true wine ferment (*Saccharomyes ellipsoideus*). In the words of M. Dupont—

> The different sensitiveness of the various organisms in the crushed grapes, and especially of the different kinds of alcoholic yeasts, has, as a fortunate consequence, a veritable natural selection in favour of the elliptical yeast, the most resistant and the most useful of all.

* E. Dupont and J. Ventre, L'acide Sulfureux en Vinification, *Progres Agricole*, 1906–7–8, &c.

Nor must we lose sight of the beneficial action of this agent in the case of wines threatened with "casse," or oxidation through the agency of a soluble ferment (as distinguished from organized ones) known as *oxydase*, so often present in faulty grapes. By powerfully protecting the wine against such oxidation, defects in connexion with colour and condition due to this cause, which is probably responsible for more damage than is usually realized, are obviated.

A remarkable and satisfactory feature is the small amount of sulphurous acid remaining in the finished wine, even though heavy doses were employed in its making. This antiseptic is essentially a temporary one, as distinguished from others, the use of which has been prohibited. It exerts its useful influence at the propitious moment during the critical time of fermentation, after which it largely disappears. A considerable proportion, no doubt, is mechanically carried off by the bubbles of carbonic acid produced by fermentation. In sulphured wines, sulphurous acid is found in three forms, viz., free acid, combined acid and sulphates; the first two of these, taken together constitute the total sulphurous acid. To again quote M. Dupont—

In a general way, and especially in vatted wines, the proportion of free sulphurous acid is insignificant, and that of total sulphurous acid which, moreover, is alone considered by regulations now in force, maintains itself within very normal limits, even in the case of treatments with a heavy dose of sulphurous acid.

As regards sulphates, which are tolerated by the Council of Hygiene and by the law of 1891, up to the dose of 2 grammes per litre in plastered wines . . . the increase resulting from "sulfitage" is relatively low (.1 to .2 grammes for medium doses) and has never reached, even with massive doses, the figure of 1 gramme per litre. No fear whatever is thus justifiable from this point of view.

ADVANTAGES OF SULPHITING.

The improvement in quality of wine made according to the new system is felt in several different directions.

Sounder and cleaner wine.—This is only what might be expected in view of the suppression of bacterial action, so often responsible for faulty wines. Comparative experiments, carried out during several successive years, have proved to MM. Dupont and Ventre—

That compared with control samples sulphited wines are always clean to the palate and have acquired coolness (*fraicheur*), a taste of fruit, and even distinction (*finesse*). These are very noticeable in the case of wine made from sound grapes, but the difference is still more marked with wine made from faulty grapes. Not only is the taste of damaged grapes (*pourri*) avoided, but in addition sulphurous acid seems to have, in a general way, the happy property of suppressing all bad tastes deriving their origin from the grapes (foxy, earthy taste, &c.).

Steady and complete fermentation.—Although the immediate effect of sulphurous acid is to retard fermentation, such action is only temporary; fermentation eventually proceeds steadily, continuing until, as a rule, more sugar has been converted into alcohol than in the case of wine made in the usual way. Thus is the resulting wine drier and less liable to give trouble afterwards.

Control of Temperature simplified.—The moderating effect of sulphurous acid on fermentation has been taken advantage of for a good many years, especially in parts of Algeria, where water for cooling was scarce. This action may, in fact, be looked upon as a sort of indirect cooling. When applied as a regular wine-making method, the same advantages are obtained from it. A gain of a very few degrees in temperature may mean the salvation of the wine, and such a gain is frequent in the case of sulphited grapes.

Increase in alcoholic strength.—In addition to more complete fermentation, an absolute gain in strength is usually noticeable, which may amount to as much as a half per cent. of proof spirit, or even more. This is due to the artificial selection above referred to, which exerts itself in favour of the true wine yeast and prevents the action of wild yeasts, many of which decompose sugar without thereby producing nearly the quantity of alcohol given by the former. In other words, it prevents waste due to the development of wild yeasts.

Increase in fixed acidity.—Faulty wines made in hot climates are usually defective as regards their acidity; the fixed acidity, derived from the grape, is too low and the volatile acidity, resulting from the development of undesirable organisms, is too high. Sulphiting reduces the former and preserves the latter, especially certain constituents of it, which are liable to suffer and be destroyed through bacterial action.

Improvement in colour.—This might appear contradictory, in view of the well known bleaching properties of sulphurous acid. Nevertheless, the improvement in colour of sulphited wines is very distinct—

> There is an improvement in colour, both in the direction of intensity and of tint. The Vino-colorimeter of Salleron reveals very clearly a satisfactory modification in the tint, which is shown to be of distinctly bright red colour, slightly violet, and free from all trace of yellow, characteristic of well-made young wines, so appreciated by the trade. At the same time there is an effective increase in its intensity, particularly noticeable with varieties poor in colour (Aramon, Carignane). The gain in colour, usually of from 20 to 40 per cent., can be even higher. . . . (Dupont).

This rather unexpected result appears to be due to the protection from oxidation already referred to.

Better and more permanent condition.—This is one of the greatest advantages of the new method and one which cannot fail to appeal very strongly to the practical cellar manager. Wines made by it, in addition to clearing more rapidly, seem to keep their condition remarkably well. This greater stability is attributed to the preservative action on several of the acids normally present in the grape, but which are frequently lost during fermentation.

Use of cultivated yeasts facilitated.—The vast question of the use of cultivated yeasts or levures will be dealt with in a subsequent article. It will suffice to say here, that if the use of pure yeasts has not yet become nearly so general in wine-making, as in the sister industry of brewing, or as was hoped when their use was first extensively tried, now many years ago, it is largely on account of the difficulty experienced by the added yeast in obtaining possession of the fermenting mass. Sulphiting insures this necessary condition, almost as effectually as preliminary sterilization, so easy in the case of brewing but so impracticable in wine-making.

. . . .

This list of advantages will, no doubt, appeal forcibly to our northern vine-growers. The following extracts from the most recent article* on the subject by M. Dupont, resume the general influence on the quality of the wine:—

> The increasing use of sulphurous acid in our vineyards as a really general wine-making method imposes itself, since it alone, so far, is capable of realizing the legitimate dream of the vineyard owner: To make good wine with certainty of success and to handle it with not less certainty until it is sold.

* *Revue de Viticulture*, vol. XXXIV., p. 259, 8th Sept., 1910.

The action of sulphurous acid does not merely concern fermentation, ceasing when the vats are racked. It continues long after; one can truly say that it dominates wine-making and the keeping of the wine.

Being practically sterilized, the wine is henceforth protected from all damage, either by oxydase (*casse*) or bacteria. One need no longer consider delicate, costly and insufficient treatments for faults or diseases.

. . . Ordinary cellar processes are considerably simplified; besides usual care of casks (cleanliness, &c.), they are reduced to little more than filling up and racking. Filtration and fining, in a thoroughly brilliant wine, become unnecessary. The latter operation is limited to correction of excessive astringency in rough or deeply coloured wines.

. . . Sulphurous acid has already powerfully contributed to the improvement of wine-making practice, hitherto so slow to take advantage of the teaching œnological science owes to Pasteur and his disciples.

. . . One is compelled to admit that it is especially since its use has become common in the shape of the addition of sulphites to the crushed grapes, that the number of badly made, faulty or sick wines, formerly so common, has considerably diminished. Such wines have almost disappeared from the trade, on which they proved such a heavy burden only a few years ago, and to which they did so much harm in keeping down prices.

Further recommendation is surely unnecessary!

DIFFERENT FORMS OF SO_2 AND DOSE TO USE.

There are four main forms in which suphurous acid may be applied to the crushed grapes:—

1. In the gaseous state.
2. Liquified under pressure.
3. Dissolved in water.
4. Combined with a base as sulphite or bisulphite.

So far as attainment of the result desired there is little or no difference between these four forms, provided, of course, that they be used in such quantities that an equal amount of sulphurous acid be added in each case.

The first has been generally abandoned, owing to the difficulty of gauging the quantity used with anything like accuracy. For further particulars see Roos' *Wine-making in Hot Climates*, where different appliances by which must or wine can be made to absorb it are described.

Liquified under a pressure of 3 atmospheres the above objections no longer hold good, especially when the the ingenious measuring devices recently placed on the market in France are employed. These have not yet found their way to Australia, however.

The sulphurous acid of commerce, a simple solution of the gas in water, is a convenient form to use. Its usual strength is 9 per cent. of SO_2. The chief drawback is the ease with which the dissolved gas is given off and strength lost unless it is kept tightly corked; it is also liable to oxidation into sulphuric acid, if kept for any length of time. Its strength is thus apt to vary a good deal; this is, in fact, its main defect. The trifling addition of water which its use entails, though sometimes looked upon as an objection, is too slight to merit serious notice. If freshly made and kept tightly corked it is a satisfactory form.

The combined form is, on the whole, the most convenient. Several sulphites and bisulphites exist, but it is in the form of bisulphite of potash that it is most generally applied in France. Potash is by far the most satisfactory base. After combination with the tartaric acid of the grape it forms cream of tartar, a natural constituent of all sound wines and one which, if in excess, is simply precipitated as argol or winestone.

Bisulphite of potash is a readily soluble crystalline salt which keeps well, especially when kept in corked bottles; if left open it is apt to lose portion of its SO_2. The form in fairly large crystals is to be preferred. In powder, it is liable to oxidation and transformation into sulphate. Different samples may vary a little in composition, but for practical purposes it may be looked upon as containing one half its weight of SO_2.

There are two forms in which this salt is known, viz., the ordinary and the "meta" form. The salt, known is meta-bisulphite of potash, is said to be more stable and less exposed to loss of SO_2 on keeping. In other respects, the two may be looked upon as practically identical.

A new proprietary compound has lately been placed on the market in France under the name of sulphophosphate of ammonia. It is a liquid containing one quarter of its weight of SO_2 as well as a certain proportion of phosphate of ammonia, a valuable yeast stimulant. (See *Journal*, April, 1909, p. 229.) This substance is highly spoken of by leading authorities.

The dose to use depends, naturally, upon the percentage of sulphurous acid contained in the product selected; it can therefore be most satisfactorily stated in terms of SO_2. Even so, an arbitrarily fixed dose cannot be laid down as being suitable for all cases. According to M. Dupont, the proper dose may vary between 7.5 and 20 grammes of SO_2 per hectolitre ($1\frac{1}{4}$ to $3\frac{1}{4}$ oz. per 100 gallons) according to circumstances. The dose is, in fact, very elastic; some authorities have not hesitated to recommend much heavier quantities—even as much as 50 grammes per hectolitre (8 oz. per 100 gallons). Such very heavy doses are not, according to M. Dupont, to be recommended, unless in exceptional cases, such as, for example, in very hot weather, when further additions may be given to check a rise in temperature.

The elasticity of the system is such that there is little danger of an overdose. MM. Dupont and Ventre consider the most useful dose to be from 10 to 15 grammes per hectolitre ($1\frac{1}{2}$ to $2\frac{1}{4}$ oz. per 100 gallons) of SO_2. This would necessitate an addition of the following quantities of each different form for every 100 gallons of grape juice:—

$\frac{3}{4}$ to $1\frac{1}{2}$ ozs. of sulphur (combustion of).
$1\frac{1}{2}$ to $2\frac{1}{4}$ ozs. of liquified sulphur dioxide.
16 to 24 fluid ozs. commercial sulphurous acid (aqueous solution of SO_2).
3 to $4\frac{1}{2}$ ozs. of bisulphite of potash.
6 to 9 fluid ozs. of sulphophosphate of ammonia.

As already pointed out, the form in which the sulphurous acid is added appears to be immaterial. Exhaustive experiments have proved that wines of equal quality can be obtained with any of the above substances. Questions of convenience and individual preference must decide the choice. In a general way, commercial sulphurous acid is cheaper and, if fresh, quite reliable in strength, whilst bisulphite of potash, though dearer, is more convenient to use and permits the dose to be gauged more accurately.

Practical Considerations.

The practical application of the method presents no difficulties. All that is necessary is to add the sulphurous acid to the fermenting mass, whether this be crushed and stemmed grapes, in the case of red wine, or pressed juice in the case of white. The two most vital points requiring attention are, its early addition and the thorough mixing throughout the fermenting mass.

The advantages of an early start are obvious. From the moment the grapes are crushed; in other words, that the innumerable and varied

organisms contained in the bloom, on the outside of the fruit, are brought in contact with the juice, their germination and multiplication begin. Prevention is better than cure and the presence of the antiseptic from the very start, will hinder the appearance of a large number of undesirables. It has even been suggested, to add it in the vineyard, in small quantities at a time, to the grapes as they are being filled into the tubs used to convey them to the fermenting house. Though no doubt an excellent course, especially in very hot weather or where long transport is inevitable, there are practical difficulties, chiefly in the direction of keeping a check on the quantity added, which render it inconvenient, and in the great majority of cases it will suffice to add the whole quantity at one time, when the vat is from one-third to half full. As filling proceeds, an occasional stirring, to equalize distribution, is to be recommended. When full, thorough mixing is essential; this is more important in the case of red than of white wine. Should the antiseptic fail to find its way to certain parts of the semi-solid mass, faulty ferments may find an opportunity for their development in these, thus impairing the efficiency of the process.

Thorough mixing can best be achieved by pumping the juice from the bottom of the vat to the top, until a complete exchange of liquid has been obtained. The system of fermentation followed in North-Eastern Victoria, with cement vats and mechanically-driven pumps in each, lends itself admirably to the new process. No change in our cellar equipment is necessary.

The abundant aeration it provides is a decided advantage. M. Dupont looks upon frequent aeration, by pumping from bottom to top, as necessary, especially in the early stages of fermentation.* On the other hand, sulphiting attenuates one of the chief drawbacks to the system, since the presence of SO_2 is a powerful protection against the evils which may result from excessive aeration. (Wines which mature too rapidly and get old before their time). In this manner the new method will probably be found to improve the quality of our wines, mainly in the direction of increased fruitiness (not to be confounded with sweetness), in addition to the other advantages already enumerated.

When adding SO_2 to crushed red grapes a curious change of colour will be noticed; this need occasion no alarm, it is only temporary. The colour returns, even stronger than it would otherwise have been.

THE USE OF A STARTER.

So far, we have only considered the simple case in which the influence of sulphurous acid is brought to bear on the natural or spontaneous fermentation of the grapes with which one has to deal.

To start the fermentation by means of yeast in active growth, either derived from specially selected grapes, grown in the same locality, or a pure culture from some other district is by no means a new idea. The latter method brings us to the large question of the use of cultivated yeasts in wine-making which will be dealt with in a future article. It will suffice to say, here, that the practice is becoming more and more general every year in Europe.

The use of a starter (*pied de cuve*, as it is termed in French) has long been recommended. It is well known that the sounder and cleaner the grapes, the more satisfactory will the fermentation be. It is equally well known that the smaller the bulk one has to deal with the better the result.

* In the absence of air, SO_2 may, under the reducing influence of yeast, give rise to the formation of traces of sulphuretted hydrogen, communicating to the wine its characteristic unpleasant odours. This never occurs if aeration is attended to.

To commence the fermentation in bulk, with a starter, in the shape of a small quantity of specially selected grapes, crushed and allowed to ferment under the most favourable circumstances possible, is, therefore, essentially logical. It is also peculiarly applicable to the new method of wine-making. The active ferment of the starter, after being accustomed to life in presence of SO_2, has an even greater advantage over competing organisms, when transferred to the large vat, than it otherwise would.

Technical details in connexion with the use of starters, being much the same as where cultivated yeasts are employed, their consideration can best be held over for the article dealing with the latter.

Conclusion.

The whole of what has been written above applies to dry wines. For the present, at least, it will be well to limit the application of sulphiting to these. So far as sweet wines are concerned, it can only be recommended experimentally and with caution. The development of a porty or *rancio* character is closely allied with the defect known as *casse*, it is largely an oxidation process. Though faulty in dry wines, it becomes an advantage, in fact, a necessary development, in the case of the sweet wines for which there is such a large demand in the local market. It is highly probable that the protection against oxidation, which enables sulphurous acid to prevent *casse* in dry wines, will, in similar manner, hinder the development of the rancio character in sweet wines.

This reservation applies also to our so-called Australian sherries. As regards the delicate wines of cooler districts, caution must again be recommended, though for a rather different reason. In these privileged regions, with cleanliness, care, and grapes in good order, fermentation troubles are of very rare occurrence. The high natural acidity of the grapes and cool temperatures during fermentation, owing to late maturity, are sufficient protection against injurious micro-organism.

Will the wines made according to the new system, faultless though they may be, equal the delicate wines which these districts have proved themselves capable of producing in years past by the old method? The question is a delicate one which can only be answered by time and comparative experiments. The writer has a clear recollection of experiments conducted by his father, at St. Hubert's, many years ago, when the débourbage system was tried. The white wine produced by it, although in many respects excellent and especially so, as regards condition, did not, with age, develop the bouquet and character of wines made in the ordinary way. The process was therefore discontinued.

In Northern Victoria, circumstances are vastly different and the advantages of sulphiting are almost certain to greatly outweigh any other consideration. There is not the slightest reason why they should not be as marked with us, in the directions previously indicated, as they have so abundantly proved in Southern France.

Whether it be dry whites or dry reds for the local market, or the heavy full bodied reds which make up the bulk of our export trade, the northern wine-maker cannot fail to welcome the possibility of regularly turning out his wine in faultless order and free from the defects which have so often given him trouble in the past.

In the hope that such anticipation will be fully realized, the new method of wine-making is now brought under the notice of Victorian wine-makers. Any hesitation the writer may have felt—and caution is always advisable in connexion with innovations in wine-making—is dispelled by the marvellous extension of the new method in Southern France.

THE WEEDS OF VICTORIA.

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist, and Professor of Botany and Plant Physiology in the Melbourne University.

INTRODUCTION.

It is proposed from time to time to issue the information collected in regard to important weeds with a view ultimately of including this matter in a second edition of the *Weeds of Victoria.* It is also proposed to continue the issue of plates of any additional plants which may be proclaimed, as well as to prepare similar plates of a few of the more important weeds, which, although highly dangerous or obnoxious, it has for various reasons not been considered advisable to proclaim. It may, in fact, be stated that it is only very rarely that proclamation is advisable in the case of annual weeds, for these do not usually damage the land in the serious way that many deeply rooting perennials do. Freely seeding annuals are practically impossible to suppress completely, and before the mechanism of the Act could be brought into play, they would in many cases have died down and disappeared. In such cases more is to be done by the spread of information as to the hidden damage which such plants do, than by an impossible attempt to enforce their complete destruction.

When the time is ripe for the issue of a second edition, the plates in the present issue will be used as illustrations to accompany the original text in its amended and expanded form, so that the second edition will not supersede the first one, but will act as a companion to it. The notes in the present series will naturally appear at first in a more or less disjointed form, but in some cases, it is important that the knowledge attained should be made immediately available, particularly where later information corrects or modifies that previously given.

COMMON BARTSIA.

Bartsia latifolia, Sibth. and Sm.

This little weed belongs to the natural order *Scrophulariaceæ*, an order which includes several plants which are parasitic more or less completely on the roots of grasses, and are therefore not only useless as fodder, but are actually injurious to pastures. Three species of the genus *Bartsia* are naturalized in Victoria. They are *Bartsia viscosa*, L., "Sticky Bartsia"; *Bartsia Trixago*, L., "Trixago Bartsia"; and *Bartsia latifolia*, Sibth. and Sm., "Common Bartsia."

It is this last plant which is the commonest and most widely spread in Victoria, and which, of late years, appears to be steadily increasing in pastures. It was originally a native of Europe, Asia, and Africa, and was first recorded in 1887, although probably introduced long before this. Its seeds, which are extremely small and light, are often found in samples of grass seeds, and it was probably with imported grass seed that the plant was first introduced. Its seeds are so small that they are easily carried by the wind, although without any specially developed wing, pappus or parachute mechanism. In addition, the seeds will float on water for a time and can be carried down slopes by heavy rains. The most fertile source of spread, however, lies undoubtedly in the readiness with which its minute seeds pass undetected in samples of grass seed.

As this plant is spreading with great rapidity to new districts and is very abundant in many of the older settled districts, it was considered advisable to carry out some experiments on its suppression at Box Hill, on

sloping pasture land, where it is extremely abundant. The fact was first definitely established that the roots are actually parasitic upon grass roots to which they establish themselves by means of little lateral suckers. The attachments is easily broken, but if whole sods are lifted and the soil washed gently away, the connexion between the two plants can easily be traced. (See Fig. on plate.)

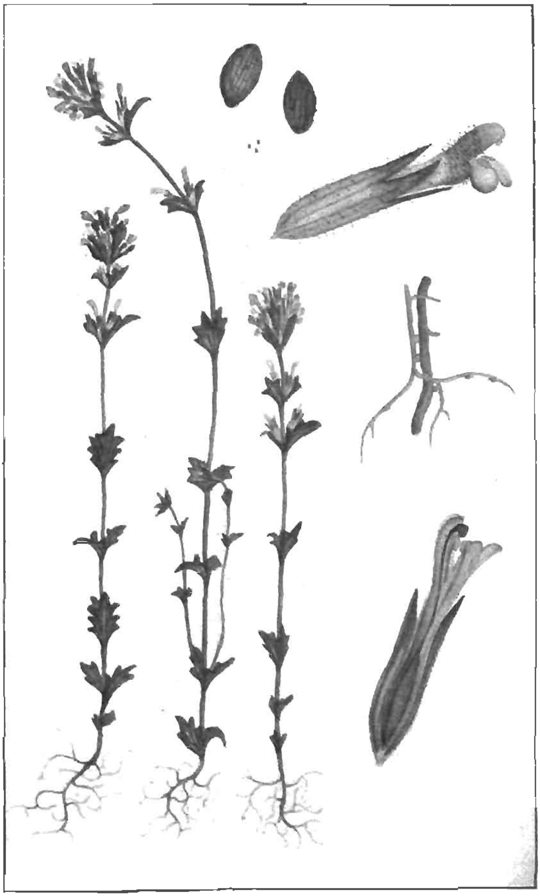
When the Bartsia plants first appear, the connexions are usually not yet established, but they are fully formed before the flowers open. If the plants are abundant, the grass may die out between them, leaving bare patches, and in these, occasional plants may be found whose roots appear to have formed no attachment with grass roots. Such plants are, however, usually short and stunted. In any case, the destruction of the grass plants becomes a very serious matter in pastures where the Bartsia is abundant, since the grass only recovers with difficulty and a moderate number of plants may reduce the carrying capacity of a pasture to one-half what it should be.

In carrying out the experiments a plot of ground was selected over which the plant was growing fairly evenly distributed. This was divided into plots each having an area of one-fortieth of an acre, the total number of plots being fourteen. The Bartsia is an annual plant propagating itself by seed and dying down at the end of summer. Unfortunately, the heavy rains falling when the ground was hard, evidently washed a large amount of the seed down on to the lower row of plots, so that the results obtained are difficult to interpret. As, however, the results are in one sense mainly negative, this is of less importance, and as all the tests were made in duplicate it is possible to control the results, although the distribution of the seed to commence with, was irregular.

EXPERIMENTAL PLOTS—ERADICATION OF BARTSIA.

—	A.	B.	C.	D.
Top row ..	Blank .. .. 118 Bartsia plants Clover small and scanty, grass thin	640 lbs. air-slaked lime per acre 152 Bartsia plants.. Grass good, clover fair	160 lbs. of superphosphate per acre 62 Bartsia plants Grass and clover good	
2nd row ..	640 lbs. air-slaked lime 1,550 Bartsia plants Grass good, clover fair	240 lbs. superphosphate per acre 416 Bartsia plants Grass and clover good	Blank .. .. 275 Bartsia plants Grass good, very little clover	Dug with cow manure, 10 tons per acre 3 Bartsia plants Rich grass and clover, but some Cape weed
3rd row ..	240 lbs of superphosphate *per acre* 10,700 Bartsia plants Grass and clover fair	Blank .. .. *2,450 Bartsia plants* Grass and clover poor	640 lbs. of quicklime *per acre* 2,900 Bartsia plants Very little clover	Dug without manure *5 Bartsia plants* Grass thin, little clover, no Cape weed
4th row ..	Blank .. .. 9,800 Bartsia plants Grass and clover poor	960 lbs. quick-lime per acre 11,450 Bartsia plants Grass and clover fair	320 lbs. superphosphate per acre 1,500 Bartsia plants The best grass and clover	

In the first place, the preliminary tests showed that poisons were quite useless for dealing with this weed. In all cases where poisons were used, the grass was affected more than the Bartsia. The plots were then used to determine whether, by the use of a chemical manure, it might be possible to stimulate the grass without encouraging the Bartsia and so to enable the



Bertha Rees, Del. A. J. Ewart, Direx.

COMMON BARTSIA.

(*Bartsia latifolia, Sibth. and Sm.*)

grass to keep down its parasite. The reason for making the tests arose from the observation that where thick patches of grass occurred over old droppings, the Bartsia was usually scarce or absent. These experiments were begun on 3rd November, 1909, and the results noted at the end of October, 1910.

It is quite evident, from the above results, that the most effective way of eradicating *Bartsia* from an affected pasture will be by bringing it under temporary cultivation for a time. The manure used, if free from weed seeds, and the working of the soil during cultivation, will leave the ground in far better heart to produce a strong, luxuriant pasture than it was before, and at the same time will reduce the parasitic Bartsia almost to vanishing point. This is of considerable importance, because a pasture badly infested with this weed must ultimately be ruined as the parasite destroys the grass.

In spite of the irregular distribution of the seed over the plots, it is possible, by averaging, to get some idea as to whether the air-slaked lime, quicklime or superphosphate affected in any way the numbers of the Bartsia plants developing. For instance, the average number of plants on the blank plots was 4,123, whereas during the previous season, the average number over the whole area was 1,740 per plot. The average for the plots treated with air-slaked lime was 1,351, and for the quicklime plots 7,175, so that if these results can be relied upon, the air-slaked lime reduces the number of seedlings establishing themselves, while the quicklime increases their number. The average for the whole of the superphosphate plots was 3,125 plants per plot, which would appear to show a slight decrease as compared with the blank plots. The same is suggested by the fact that the superphosphate plot in the bottom row had considerably less plants than the plots above and to the side of it, but this may have been connected with the fact that the grass and clover on this plot, which received the heaviest dose of superphosphate, was thicker and more abundant than on any other of the plots. Apparently, wherever the grass and clover are very vigorous, the Bartsia is smothered, since although its roots are parasitic, the plant has green leaves and needs to be fairly well exposed to light to attain its full development. Hence the abundant presence of this weed in a pasture may be regarded as a sign that the pasture is deteriorating and that the soil needs to be loosened, opened and manured.

It was also found that on another plot where the plants had been cut before they were able to ripen any seed, only 112 plants developed and on another one which had been carefully hand-picked, only 24 plants appeared in the following year, the seed of which had probably been carried by wind or water.

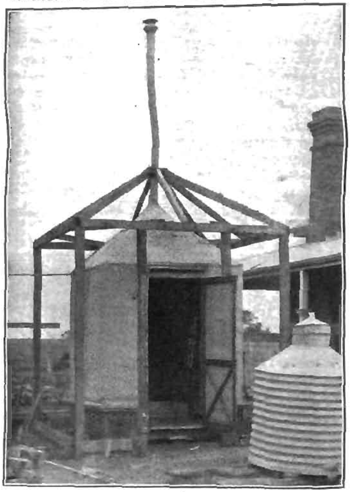
Apparently, therefore, the seed of the plant is very short-lived, and it might be possible in cases where the pasture cannot be cultivated, to keep down the weed by dressing with superphosphate in winter or spring and mowing in October to November, when the plant is in full flower and before it has seeded. Since the stem is short, however, and usually not more than 3 to 6 inches high, this would only be of use when the ground is fairly smooth so that it can be mown. The only effective mode of suppression appears to be by bringing the pasture under temporary cultivation, taking care to avoid the re-introduction of the weed when the pasture is seeded down again.

COOL STORAGE ON NORTHERN FARMS.

C. A. Ryland, Dairy Supervisor.

Cool storage for perishable produce on the farm is a necessity during the summer months, especially in the northern districts. To meet this necessity, the canvas room illustrated was erected by Mr. W. G. Dickeson, of Laen North, near Donald, and has been used with satisfactory results during the past twelve months.

The room is 6 feet square, and 6 ft. 6 in. in height. It is provided with a fly-proof perflation panel 9 inches high immediately above the floor and running round the four walls. The roof is fitted with a cowl ventilator which allows a direct draught upwards. A pine floor, protected from white ants, is provided. It is the intention to grow creepers on the wire-netting framework outside.



MR. DICKESON'S COOL ROOM.

Water laid on from the tank filled by the farm windmill is distributed over the roof and walls by perforated lead piping. Surplus water is caught in the spouting above the fly-proof ventilation and is directed to a thriving vegetable garden, which conveniently needs moisture in the hot weather when cool storage is required, so that the water is thereby doubly utilized. The low temperature of the room is created and maintained by the evaporation of the moisture in the walls and roof.

Mr. Dickson has not used a thermometer in the room, but he states that water in a water-bag hung there keeps much cooler than in a water-bag under the house verandah. At present it is principally used as a meat-room, and meat has been kept perfectly fresh in it for as long as thirteen days.

The principle of evaporation for cooling purposes is not new, water-bags having been in use a great many years; and it has been applied to household cupboards built with canvas or hessian walls supplied with water from a kerosene tin standing on top.

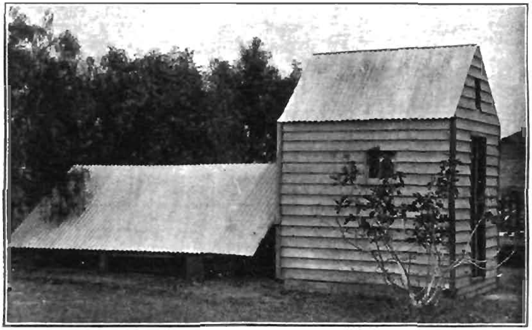
The room described was built with day labour for the sum of £10, and it is interesting to note that the same builder has already built nine

similar rooms in the Wimmera for use this summer. Mr. Pyers of Carron has an economically built one under his tankstand, the posts of which are used to carry the canvas walls.

The second illustration is that of a dairy building recommended for use in the northern districts.

The need for handling dairy produce in a cool, well-lighted, and well ventilated building which can be easily cleaned, need not be enlarged upon here. It is sufficient to say that the building illustrated meets the requirements, and is a great improvement on some of the structures at present in use as dairies in the northern district.

The dairy is almost completed on the farm of Mr. J. Baker, of Donald, who retails milk and uses a separator. It is in two parts, namely, a separator room above ground, and a storage room underground.



MR. BAKER'S DAIRY.

The underground walls are of bricks laid singly and a ledge is provided for holding milk, and cream cans, &c. The lower building is doubly ceiled with pine lining boards, and carries an iron roof about 18 inches above the ceiling and overlapping the walls. The floors throughout are of brick, grouted and faced with cement. Ventilation is provided by vents from floor to surface outside the walls opposite the door which gives direct draught.

The separator room is of weatherboard, lined and ceiled with pine, and provided with ample fly-proof ventilation. It could be used as a dairy and cream room during the winter months.

The disadvantages of wholly underground dairies where milk to be separated is carried downstairs and then upstairs can easily be seen, as also the difficulty of keeping the floor which cannot be drained sweet and clean. Furthermore, undesirable moulds seem to find a lodgment in these dug-out rooms which consequently always have a more or less musty atmosphere.

RAINBOW FARM COMPETITIONS.

J. M. B. Connor, Agricultural Superintendent.

The judging for the Rainbow Farm Competitions took place on the 2nd, 3rd and 4th November.

The number of entries received for each of the competitions speaks well for the intelligence of the farmers of the district; and I hope that the spirit of friendly rivalry engendered will be maintained during the coming year. There is no doubt that the Farm Competitions held in the various agricultural centres throughout the State are the means of bringing about improved methods of cultivation and greater success in modern farming generally.

Best Worked and Managed Farm, 640 acres or over.

Section.	Maximum Points.	F. J. Chaplin.	A. G. Cust.	J. H. Heinrich.	S. Dart.	J. Watt.
A.—Cropping operations, including cultivation methods, rotation of crops, &c.	20	16	15	15	16	16
B.—Manuring, also care of stable manure	20	15	16	17	14	12
C.—Best and cleanest crop, including oats	20	12	12	12	13	14
D.—Live stock—Horses (15), Sheep (12), Cattle (5), Pigs and Poultry (8)	40	30	35	20	21	28
E.—Best system of fallowing and working fallow: area to be considered	15	13	0	14	10	12
F.—Implements and machinery	15	14	9	7	7	8
G.—Subdivisional fencing, gates and sheep-yards	10	10	8	6	6	3
H.—Kitchen garden and orchard	10	9	7	4	5	2
I.—Water supply	20	16	18	16	15	16
J.—Farm buildings	20	17	18	16	10	12
K.—Fodder reserves	15	14	8	10	12	8
L.—Shelter belts	10	7	6	8	5	5
M.—Farm book-keeping	10	8	9	8	5	0
Totals	225	181	161	153	139	136

The following remarks dealing with the various sections will indicate to the competitors wherein they gained or lost points.

A.—The management shown in the working of the farms inspected is much the same in each case. I am of opinion that much better results would be obtained if the land were thrown out of cultivation for a longer period than is practised by most of the competitors.

B.—Superphosphate was used in the majority of instances in amounts from 45 to 60 lbs. per acre, so that the points in this section are very similar, but the proper use of the large quantities of stable manure is sadly neglected. At most of the farms I was told that it was left lying about until carted on the fallow land. In two cases, Messrs. Cust and Heinrich's, it was put to better account by being carted on the bare or wind-swept patches and ploughed in; this is certainly a move in the right direction. The practice of properly pitting the manure and draining the liquid portion into the pit, only requires to be tried once—the results will be convincing.

C.—The crops on the whole were uniformly good as regards growth and likely yield. The presence of wild oats, thistles, the small white

daisy, and, in some cases, "white heads" is to be regretted. I observed that the oat crops were freer than the wheat from foreign matter. If a more thorough system of cultivation, earlier fallowing, and a proper system of rotation of crops were practised, these evils would be greatly checked. The cultivation ground would also be better if allowed to remain in pasture longer and grazed with sheep, than the system practised on most of the farms at present.

D.—The breeding of horses is attracting much more attention at the present time throughout the Mallee, than at any other period in the history of the State. The keen demand existing during the past five years, and the cutting up of large estates, is no doubt responsible to a great extent for this condition. The farmer who breeds the right stamp of animals need not have any fear of over-production or depressed condition of trade. I was glad to see that the Rainbow farmers are steering clear of the pernicious habit that prevails so much among many farmers, of breeding from nondescript sires. The stallions used in the district are of good type. The beautiful brood mares and foals inspected would justly grace any stud, particularly was this so on the farms of Messrs. Cust, Dart, Nowotna, and Watt. The foals in each case gave promise of growing into valuable animals.

The importance of keeping large numbers of sheep is fully recognised by most of the farmers. The stud flock of pure bred Lincolns on Mr. Cust's farm will be of great value to the district in the near future. Mr. Chapman has the largest number of sheep and has bred up a very fine class of large framed crossbred ewes. He is working on sound lines and his crossing methods, and care of the future maiden flock ewes have much to commend them. He has received the sum of £340 5s. 10d. from the sale of wool, lambs, skins, and tallow, since January, and still has on the farm 1,032 ewes and lambs. This shows the profitableness of keeping a good class of sheep.

As far as cattle, pigs, and poultry were concerned sad neglect was evident on most of the farms inspected. As necessary adjuncts to the well being of any well managed farm, and more particularly to the farmer's family, these three classes of stock should receive more favourable attention. With such an abundance of suitable foodstuffs, what animals would be of more economical value than a few well bred breeding sows? The few head of milking cows on the farms of Messrs. Cust, Chaplin and Watt were of good quality and type, but in all cases there are justifiable grounds for increasing the numbers. This could be very profitably done if the farmers would only take the precaution of saving the large quantities of surplus native grasses, and weeds that are at the present time allowed to go to waste. Silos could be very profitably utilized in this way.

The pigs seen were of a very inferior type, with the exception of Mr. Chaplin's sows; the returns received from the 1st January totalled £54 17s. 9d. The same owner has also already received £15 5s. this season for eggs. These returns must surely impress upon the farmers of the district the advisability of keeping both pigs and poultry. Some of the pig-styes inspected were not only insanitary but a menace to health. Mr. Cust is to be commended for the keenness displayed in his pens of pure bred poultry and the district will be the gainer for his enterprise.

E.—In the section for the best system of fallowing and working fallow, the competitors were not very uniform in their work and there

room for general improvement. That of Messrs. Chaplin and Heinrich was much superior to the others. A mistake often made is that the work is done too late and not deeply enough, and the object of the system of fallowing is lost, to a certain extent. There are few wheat fields upon which crops of any kind can be brought to maturity with the maximum yields that the soils are capable of producing, without adopting some suitable means of saving soil moisture. The fallow ploughing should be finished early to give the winter rains a chance of soaking into the loose soil. The effectiveness of subsequent tillage in soil moisture is greater in the spring than at almost any other time. In the spring there is invariably a wet surface exposed, and this wet surface carries off much more water very rapidly. The farmer should aim to keep simply a dry, shallow loose blanket of soil, which will make an effective mulch. It frequently happens that, owing to the large area to be covered, it is not possible to work it all as early as would give the best results. In such cases, where one has not time to form a thorough mulch, a single cut of the disc, or even the spiked-tooth harrow, will work wonders in conserving soil moisture.

F.—For the most complete equipment and class of implements and suitable machinery, Mr. Chaplin is very much ahead of the other competitors. No doubt, a good deal of his success can be attributed to the use of modern machinery. All implements were under cover in a splendidly built shed, and showed care and attention. What is there about a farm that indicates the poor management of its owner, more than to see farm implements left out in the sun and rain? On the whole, the implements on the different farms were in good order and up to date.

G.—The majority of the competitors have the ordinary post, five plain and one barb wire fences, and "Cyclone" gates, and there is not much to choose between them. The excellent fences surrounding the homesteads and subdivisional paddocks of Messrs. Cust and Chaplin are worthy of special mention. Mr. Chaplin's property has no less than 22 miles of rabbit proof wire-netting and 22 splendidly set up rabbit proof wire gates. The whole of his boundary and subdivisional fencing is wire-netted. Although this might appear to the casual observer an expensive undertaking the financial results have been such as to warrant the expenditure. Rabbits appear to be on the increase throughout the district and, as one who has had a wide experience of their destructiveness, I would seriously draw the attention of the farmers to the immediate necessity of stamping them out.

H.—In the section for the best kept kitchen garden and orchard there was plenty of room for improvement. One of the chief pleasures and profits of a farm, but what was absent from so many of the properties inspected, is the vegetable garden and orchard. From the standpoint of health, as well as that of economy, a plentiful supply of vegetables and fruit is desirable. In most cases also, great interest is taken in the vegetable garden by the women of the household who fully realize its value; and it is often the means of keeping the boy on the farm by encouraging him to minister to the comfort of the family through a well-kept and profitable garden.

The owner of the winning farm (Mr. Chaplin) has received since January the sum of £55 9s. 6d. from the sale of fruit and vegetables. At the time of inspection, growing in profusion, there were peas, cabbages, lettuces, carrots, potatoes, tomatoes, cucumbers, water and pie melons,

half an acre being so occupied. There is also $\frac{3}{4}$ acre of vines, and a good assortment of fruit trees, consisting of the following:—

Almond, 8	Fig, 8	Peach, 8
Apple, 4	Mulberry, 1	Pear, 8
Cherry, 3	Nectarine 2	Quince, 2
Cherry Plum, 4		

This vegetable garden and orchard showed both care and attention.

I.—The vital importance of an adequate supply of water is fully recognised by all the competitors. I was agreeably surprised to find such excellent provision made for water storage, both for stock and household purposes, in the shape of dams and underground tanks and well protected in most cases from the disastrous effects of the sun's rays during the summer months. Most of the dams were conveniently situated, as regards catchment and accessibility. It is, however, necessary that the stock dams should be fenced off to prevent their becoming fouled by the stock.

MALLEE HOMESTEADS.

Windmills, pumping from dams, are utilized on the farms of Messrs. Cust and Heinrich; and in both cases there are also good storage iron tanks providing an adequate supply for the homestead and outbuildings. This provision is a great convenience to the women folk who play such an important part in the successful working of a farm. Water is laid on to each paddock on the property of Mr. Cust, who therefore scores a large number of points in this section.

J.—The homesteads of Messrs. Chaplin, Cust, and Heinrich are worthy of comment, and they clearly show that the owners have undoubted confidence in the stability of the district. When viewing these substantial and comfortable homesteads, one is apt to forget the work that was entailed in clearing the Mallee. The transformation has indeed been marvellous. The dwelling on Mr. Cust's farm possesses many features of comfort and artistic architecture, is well furnished, and an acetylene gas-plant is installed. The comfortable stone homestead of Mr. Heinrich

is similarly lighted. The other homesteads inspected are on a smaller scale, but show signs of progress in the way of recent additions.

In the matter of outbuildings, Mr. Chaplin has the most convenient and most suitably arranged stables, shearing shed, implement shed, barn, and dairy. Wherever one looks there is marked evidence of thrift; there is the absence of bags and rubbish lying about that was to be seen on some of the other farms.

The rough pole sheds, thatched with scrub and straw, erected on the majority of the farms are not in keeping with the other substantial improvements. The erection of silos for the conservation of the enormous quantities of green succulent herbage that are now being allowed to go to waste is strongly advised. When they are not used for this purpose they would be of great value for storing grain. Profitable returns would be secured by the use of silage in the feeding of sheep and the fattening of early lambs for market.

K.—The next section is that dealing with the best system adopted of conserving a reserve of fodder for dry seasons. There is not the care displayed that one would expect to see after the severe lessons taught during the droughts of 1902 and 1903. Messrs. Chaplin, Dart, and Heinrich have each a good standby in the way of large stacks of hay. Mr. Chaplin's large stacks are well protected from fowls and properly thatched. I could not but help admiring the thorough manner in which every kind of work about the stack-yard is done.

The system adopted for saving bags is also worthy of note. Two posts, about 6 feet high, and 10 feet apart, are stood upright in the ground, and then capped with a stout long sapling. The bags are spread over the sapling, covered with a tarpaulin, and further protected with sheets of galvanized iron lashed down with wire. The posts have pieces of tin tacked around them about 2 feet from the ground to prevent mice from crawling up. This is much better than to have the bags lying all over the place.

L.—On most of the farms care is being taken to save small belts of native trees for shelter. Messrs. Chaplin, Cust, and Heinrich have shown much forethought by growing plantations of young shelter and ornamental trees around their respective homesteads. There is nothing that impresses one so much on entering a farm as to see the homestead and surrounding paddocks snugly protected with shelter trees.

In the open paddocks there is a great want of trees for shelter and wind breaks. Domestic animals instinctively seek the grateful shelter of trees during the intense heat of summer, and the fierce winds of winter. A few plantations of sugar gum trees and pines would be ornamental as well as effective.

M.—Farmers are adjusting themselves to changed conditions of farm work and are beginning to realize the importance of keeping a set of books for the purpose of ascertaining at the end of each season which are the most profitable crops to grow and stock to breed and feed. Some of the competitors appear to rely solely on their bank book for information, but this is not sufficient; others keep a day-book and ledger and are able to give details of their receipts and expenditure. There is great room for more business-like methods on the part of the majority of farmers. It would be well to introduce a system of planning ahead, so that the work of the whole year will be seen at a glance and the necessary provision made. Incidently, I think that there should be more reading of agricultural papers. For instance, if the *Journal* were read more by those interested in agriculture better results would be secured.

It is satisfactory to find that some farmers recognise the importance of not carrying all their eggs in one basket. The keeping of sheep, cattle, pigs, poultry and bees and growing of vegetables are adjuncts that contribute in no small measure to the comfort and prosperity of the well managed farm. The advantage of having a good supply of milk for the growing family is in itself a sufficient reason for keeping cows. It is to be hoped that the good example set, by the owner of the winning farm, will act as an incentive to other farmers throughout the district.

To show the importance of giving more attention to this side of the farm, instead of devoting the whole of one's energies to the growing of grain, it should be sufficient to state that Mr. Chaplin during 1910 (to 3rd November) has obtained the following returns from sales of stock and produce from his farm of 1,683 acres (including 300 acres sand hummocks):—

	£	s.	d.		£	s.	d.
Chaff	21	17	7	Eggs	15	0	0
Young Stock (9 Horses) ...	160	3	6	Fruit and Vegetables ...	55	9	6
Wheat	516	4	4	Horse Hair	2	0	0
Sheep Skins	25	3	4	Wool Clip	220	0	0
Tallow	5	2	6	Fat Steer	6	0	0
Pork	54	17	9				
Honey and Wax ...	8	0	0	Total	1,170	18	6
Sheep	90	0	0				

At the present time the farm is carrying 1,032 sheep, 20 horses, and 8 head of cattle. There are 360 acres under wheat and oats and 104 acres fallowed. Evidences of prosperity can be seen in the well kept garden and orchard, lucerne paddocks, and the condition of the stock, &c.

Best worked and managed farm over 100 acres, and not exceeding 640 acres.

Section.	Maximum Points.	C. Nowotna.	G. A. Hoffmann.
A.—Cropping operations, including cultivation methods, rotation of crops, &c.	20	16	12
B.—Manuring, also care of stable manure ..	20	15	12
C.—Best and cleanest crop, including oats ..	20	10	12
D.—Live stock—Horses (15), Sheep (12), Cattle (5), Pigs and Poultry (8)	40	30	17
E.—Best system of fallowing and working fallow; area to be considered	15	13	10
F.—Implements and machinery	15	8	7
G.—Subdivisional fencing, gates, and sheep-yards	10	7	5
H.—Kitchen garden and orchard	10	8	0
I.—Water supply	20	17	15
J.—Farm buildings	20	16	8
K.—Fodder reserves	15	7	5
L.—Shelter belts	10	6	5
M.—Farm book-keeping	10	5	0
Totals	225	158	108

Best Fallowed Land, not less than 100 acres.

(All competitor's land fallowed to be shown.)

Competitor.	Points awarded. (Maximum 15.)
W. Barnes	14½
J. H. Heinrich..	14
F. J. Chapman	13½
C. Barnes	13
S. Dart	12

In this competition the fallowed land inspected reflects great credit on the individual farmers. As the points indicate I had a difficulty in deciding the relative positive results of the competitors. As far as cleanness, and thorough pulverisation of the soil go, Mr. Heinrich's land was the best; on the other hand, Mr. Barnes had his land fallowed much earlier and fully 3 inches deeper than any of the other competitors. These two points are of vital importance, and told in favour of Mr. Barnes. One could dig down to a depth of between 7 and 8 inches anywhere on his fallow paddock and find the soil absolutely wet. Successful farmers strongly recommend deep and early fallowing for several reasons—it increases the water-holding capacity of most soils, admits sunlight and air, extends the root-feeding area, and by conserving the available moisture it enables crops to successfully withstand long stretches of dry weather. Deep ploughing is only recommended where there is a good depth of soil, and in no case where the subsoil is near the surface.

Best 100 acres of growing crop.

Section.	Maximum Points.	F. Fisher.	W. Barnes.	A. G. Cust.	H. Schuller.
A.—Cleanness	10	10	9	7	3
B.—Trueness to type ..	10	9	8	8	9
C.—*Freedom from disease*	10	9	8	8	5
D.—Approximate yield per acre	1 point per bushel	27	25	20	16
Total ..	..	55	50	43	38

SUMMARY OF AWARDS.

Best worked and managed farm of an area of 640 acres or over.

(1) F. J. Chaplin. (2) A. G. Cust. (3) J. H. Heinrich.

Best worked and managed farm of an area of over 100 acres, and not exceeding 640 acres.

(1) Carl Nowotna. (2) G. A. Hoffmann.

Best 100 acres of growing crop.

(1) F. Fisher. (2) W. Barnes. (3) A. G. Cust.

Best fallowed land, not less than 100 acres.

(1) W. Barnes. (2) J. H. Heinrich. (3) F. J. Chaplin.

The facts brought under notice will be the means, I hope, of indicating the lines for future improvements and, I trust, the competitors will accept them in the friendly spirit in which they are given. There is clear evidence that the farmer need not be tied down to his one crop of wheat, but that there is at his command numerous other methods of making money.

Before closing my report I wish to convey to the President, Mr. J. Saunders, my sincere thanks for the loan of his motor car which enabled me to complete the work of judging in three days, instead of a week under ordinary travelling conditions. I also wish to thank the secretary, Mr. G. R. Riby, for his courtesy and the excellent arrangements made for the inspection of the various farms and crops, and Mr. J. Dart for the valuable time he put at my disposal in directing the location of farms to be judged.

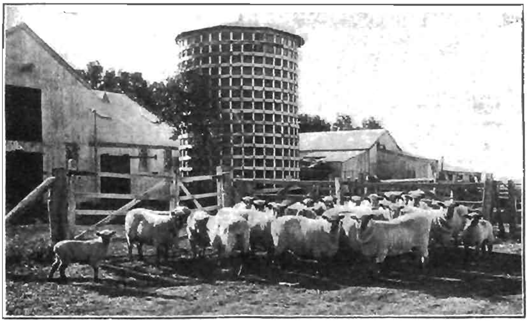
SHROPSHIRES FOR MIXED FARMING.

G. A. Sinclair, Principal, Longerenong Agricultural College.

Though, for the present, unfashionable, it does not follow that Shropshires are therefore unprofitable. Indeed, our experience leads one to conclude that they are amongst the most profitable breeds that can be used on a mixed farm.

For some years, the College lambs have realized either the highest price in the district, or nearly so. For the past two years, they have been sold in one line, *i.e.*, with an allowance to the buyer of 10 per cent. of rejects, and the results have been very satisfactory. Last year, 7 per cent. were rejected, and this year only 5 per cent.

Our experience teaches us that we get best results by using Shropshire rams on crossbred or comeback ewes, these being better mothers, and the mortality in lambing is far less than when merino ewes are kept. This season we obtained 98 per cent. of lambs with little or no loss among the ewes, and they realized 11s. 6d. per head delivered at the local railway station.



SHROPSHIRE SHEEP AT LONGERENONG AGRICULTURAL COLLEGE.

We have 750 ewes. The rams were put with them on 8th November, and lambing started on 11th April. The ewes were running on the stubble, which we do not burn off. We find, even in dry autumns, that the undergrowth, protected by the long straw, affords good grazing. When the rain comes early (as it did last season, in the shape of a heavy downpour of 3½ inches in the middle of February), the grass which springs up is usually burnt off by the sun in a few weeks. The long stubble left after the harvesters protects the young growth, and good feed can always be found in these paddocks.

An objection raised to the breed is the small return from the wool. For some years past our Shropshire wool has realized as good prices as the comeback and crossbred wool. This season, for instance, the Shropshire fleeces brought 10¾d. per lb., and the pieces 9d. per lb., whilst the highest of the other wool was 11d. per lb. (for a small quantity), the bulk selling for 10¾d.

Our pure Shropshire flock of 84 (mixed sexes) returned an average weight of fleece of a little over 6 lbs. per head, which, at the prices mentioned, comes out at 5s. per head.

It is true that the Shropshire cross lambs do not cut a heavy fleece, and are therefore less profitable than some other breeds, if rejected as freezers; but I think, with a legitimate market, there is little risk of more than a fair percentage of rejects, and the local butcher can generally deal with those.

To show the profit on the sheep-breeding operations this season, it may be mentioned that the crossbred ewes purchased in December, 1909, to supply the places of those culled out for age, cost 11s. 6d. per head; and they cut 9 lbs. of wool each, which, at the average price, realized a little over 6s. Thus, the lambs paid for the ewes; and we have the wool and the ewes for working expenses and profit.

EXPORT LAMBS.

(*Continued from page 787, Vol. VIII.*)

TAIL SEARING.

Long docking is another fault which has been strongly in evidence during the past season. From 30 to 40 per cent. of the lambs killed for export have tails too long—whole flocks with tails 5 and 6 inches in length are met with.

The fear of scorching the anus when tailing with the searing iron appears to have brought this practice about, although some leave the tails long even when they use the knife. Many farmers hold that the lambs look better in the paddocks, and that by getting a good handful of tail, buyers, when handling them, think they are fatter than they really are. But this does not say much for the buyers.

Leaving tails too long is really against a lamb-raiser's interest, for a short tail is always better covered on and about that part, than a long one, breeding and feeding of course being equal. Whether a tail be long or short, the same amount of fat is directed there. If the tail be cut short, the fat is then blocked in its course, and naturally collects. If long, then the fat is distributed over a greater area, and the parts about are plainer.

When tails are found too long they are often cut off by the butchers when dressing the lamb, and this makes the part still more unsightly. Any lamb, whatever quality or grade, will dress better with a short tail about 2 inches in length. Even if cut ridiculously short, as some are found, of the two evils too short is better than too long.

Long tails are annoying to the butchers. The work is done at a rapid rate, and at times through the tails being too long the adjacent parts are torn and disfigured.

A two or three joint dock on lambs tailed before six weeks old, dresses neatly and easily, and adds a nice plump appearance to the legs and quarters. During the export season, a few lambs are found with the tails newly seared, or recently cut. These marks are very objectionable when the lamb is dressed. Tail-searing is not yet general. Some lamb raisers have either been clumsy, or used clumsy instruments, and stripped the flesh, leaving the bone projecting. This must rot back before the flesh can heal.

over it. Again, very fat ram lambs, when castrated and tail-seared at the same time, are most likely to develop tetanus. Lambs that bleed freely at the tail have the least congealed blood in and about the purse.

Wherever possible castrate ram lambs whilst they are young, and leave the tails to be seared off later, when the ewe lambs are being tailed. Early maturity will be still further developed by adopting these methods.

We will have sufficient freezing works in this State by next season to deal with a total of 200,000 lambs per week. Farmers hold the prevention of glutted markets to a great extent in their own hands. It is possible, by studying better shape in the sheep used, by evenly bred ewe flocks, wise crossing, and good feeding, together with early castration and tail searing (which are the chief evils to be corrected), to have lambs, in sufficient numbers, ready two or three weeks earlier than hitherto. This, provided the season is favourable, will allow of 600,000 lambs being out of the way before the usual rush through grass seed and harvest work comes on.

Any relief from crowded markets must come from the general adoption of better methods by lamb-raisers in the northern districts. The late rains relieved the usual rush this season, as well as causing greater numbers to be of exportable quality. The first lambs, shipped by Borthwick's Portland Works, were in London before the middle of September, and pronounced "nice quality." This is a step in the proper direction—holding lambs over in any numbers at the end of the season is not possible in average years.

The season just closing has been exceptional, and it was possible for second-rate stock, and rough and ready methods, to show fair returns. Some of our seasons will be short and moderate, and it is in those years particularly that careful management and early selling of lambs at reasonable prices will show most to advantage.

GEESE ON THE FARM.

H. V. Hawkins, Poultry Expert.

High land is not always available to the small farmer, but those who have low-lying or marshy soil not suited to poultry generally may with advantage keep a few geese. Although a large number of geese are raised each year, there is much room for expansion.

The Warrnambool district provides the greatest number of geese for the Christmas markets. At the time of writing one may see hundreds of birds grazing on the flats between the railway and the ocean at Warrnambool. Fishermen have informed me that their wives do remarkably well with their Christmas geese.

While there are differences of opinion as to which is the best breed, I prefer the Toulouse. At the same time, there are some very fine specimens of the Embden and African to be seen. The Toulouse goose does well in this climate and is profitable when conditions are suitable.

Toulouse geese mature rapidly and attain great size. When fattened, they bring good prices—last Christmas goslings brought from 10s. to 12s. per pair, whilst grass-fed birds were sold at 7s. 6d. per pair.

The Embden (white goose) may with great advantage be crossed with the grey Toulouse, adding size and stamina.

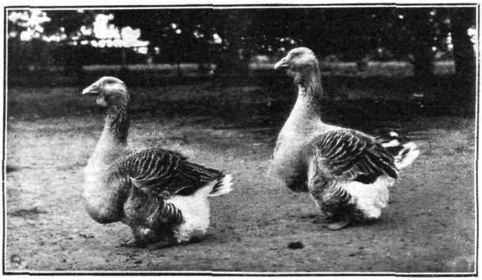
The breeding and management of geese must be carried out on altogether different lines to those necessary in duck farming. While ducks

will do fairly well when confined in yards and fed upon such green feed as is found there, geese will not thrive if kept in this manner. They need a large area to graze upon. If pools or streams be within easy range, there need be little fear with regard to fertility.

Breeding geese require very little grain; in fact, they can practically do without any. Throughout the winter they should receive ample supplies of clovers and vegetables, such as beet, cabbage, &c., with a little bran and pollard, and a few oats at night.

Do not buy over-large stud birds: show specimens are not always safe breeders, as they are often too fat and fat birds produce infertile eggs.

One male bird with two to three females is usually found satisfactory, but the age of the parents is of great importance. It is practically useless to use immature geese—5 to 8 year-old birds are much more satisfactory. A well known breeder states that his geese when 17 years old bred strong goslings.



TOULOUSE GEESE.

Geese for market purposes are best hatched under natural conditions. If left to run with the old birds they need very little care and are certainly safe—the gander is equal to any occasion when protecting the young.

Many breeders prefer to hatch goose eggs under large hens, 4 or 5 eggs to each, the nests being always made in damp soil. It is not desirable to interfere with the bird during the period of incubation. The goslings should remain in the nest for at least 20 hours, before being disturbed or fed. They may then be removed and supplied with young cut grass and some oatmeal. A little hard boiled egg and bread should be added and made somewhat pasty with skim milk. They need a fair start, after which it is astonishing how soon they commence to graze for themselves. Subsequent development is rapid.

When large enough the young geese may be fattened. This is usually done by shutting them in a clean shed, which should be scattered with dry straw, and free from draughts, but with plenty of fresh air. Give plenty of stout white oats in water vessel for 20 days. If the birds are somewhat dirty in plumage give them a swim, as clean goslings will sell better than a dirty lot—appearance counts for much. No food should be given for at least 12 hours prior to killing.

A liberal supply of fine sharp grit is necessary from the first. Clean water to drink should also be given. After two weeks have elapsed a swim will do them good, but on no account drive them into the water. Let them take to it of their own accord.

Very little shelter is required. A rough thatched shed free from extreme draughts is all that is wanted. It should be well littered with dry grass, pine needles, or straw. The sheds should be cleaned once a week.

FEEDING COWS FOR MILK PRODUCTION.

R. T. Archer, Dairy Expert.

Cows may be looked upon as machines to convert fodder into milk. The body is composed of a mass of cells which are continually being worn out and have to be renewed from certain ingredients of the food. Milk is manufactured by first building up the cell system of the udder and from the flesh-forming ingredients of the food; and then converting these into milk.

A mixture of grasses and clovers is the best food for milk production. A cow, when in full milk, requires about one-tenth the weight of her own body per day, *i.e.*, a cow 1,000 lbs. live weight requires 100 lbs. of grass and clover, or its equivalent in other food, per day. When the clovers are in bloom and before the grass seeds ripen, it is practically a balanced ration, *i.e.*, it consists of about 75 per cent. water and 25 per cent. dry matter.

The dry matter consists of 10 lbs. indigestible and 15 lbs. digestible or soluble, the latter being dissolved by the digestive juices secreted by the glands and cells of the stomach, absorbed into the blood stream, and conveyed to the different parts of the body to be used by the various cells for their nourishment and reproduction. The soluble matter consists of 12 lbs. carbo-hydrates, 2½ lbs. protein and ½ lb. fat. This represents a balanced ration, *i.e.*, the different ingredients are in the proportions that can be made use of by the cow.

Carbo-hydrates, so called because they consist of carbon and water, and represented in the food by sugar, starch and gum, are heat and energy producing foods. Fat or oil is used for the same purpose, but a given weight is worth two-and-a-half times that of carbo-hydrates. Fibre gives bulk to the food and by pressure in the stomach causes the muscular activity which mixes the digestive juices with the food. Protein is the most important part of the food, and, in addition to carbon and water, contains nitrogen, phosphorus, sulphur, lime, &c., from which the cell system of the body is replenished and so the milk is produced. The secret of the production of milk is to provide food containing sufficient protein.

Balancing the ration means mixing the foods so as to provide the different ingredients in the correct proportions. For instance, 100 lbs. green lucerne contain 1¼ lbs. more protein than a cow can make use of, but it would take 164 lbs. to contain 12 lbs. carbo-hydrates, and this would increase the loss of protein to 3¼ lbs. Again, with maize containing 1 per cent. protein, a cow would have to eat 250 lbs. to get the required amount of protein, but 100 lbs. green maize contain the right

amount of carbo-hydrates. Then, if 250 lbs. are eaten, 17½ lbs. carbo-hydrates go to waste; or, in other words, for every ton of maize used, 1½ tons are wasted, passing through the system unused.

As it is a physical impossibility for a cow to eat much more than 100 lbs. of maize, a cow cannot eat sufficient in a day to provide her with sufficient protein to keep up her milk flow, if fed on maize alone. On lucerne she would give her full milk supply, but at an extravagant cost; while, mixing the two, balances the ration and enables her to make full use of both.

The following table is taken from the article on Feeding of Farm Animals by Dr. Cherry, which was published in the *Year-Book of Agriculture* for 1905:—

THE BALANCED RATION.

Assuming that a Cow weighing 1,000 lbs. requires 100 lbs. of Fodder per Day.

100 lbs. of fodder	75 lbs. water. 25 lbs. dry matter.	25 lbs. dry matter	10 lbs. indigestible fibre 12 lbs. carbo-hydrates. 2½ lbs. protein ½ lb. fat.

DRY MATTER AND DIGESTIBLE NUTRIENTS IN 100 LBS.

Feed Stuffs.	Dry Matter in 100 lbs.	Digestible Nutrients in 100 lbs.			Nutritive Ratio.
		Protein.	Carbo-hydrates.	Fat.	
Green Fodder—					
Barley	21·0	1·9	10·2	·4	1 : 5·8
Clover, Red	29·2	2·9	14·8	·7	1 : 5·7
Cocksfoot Grass	27·0	1·5	11·4	·5	1 : 8·4
Cow Pea	16·4	1·8	8·7	·2	1 : 5·1
Horse Bean	15·8	2·2	7·1	·2	1 : 3·4
Lucerne	20·0	3·7	7·3	·6	1 : 2·3
Maize	20·7	1·0	11·6	·4	1 : 12·6
Oats	37·8	2·6	18·9	1·0	1 : 8·2
Rye	23·4	2·1	14·1	·4	1 : 7·1
Saltbush	23·5	2·5	9·2	·3	1 : 3·9
Sorghum	20·6	·6	12·2	·4	1 : 22·0
Soya Bean	24·9	3·2	11·0	·5	1 : 3·8
Vetch	19·9	3·9	7·3	·5	1 : 2·2
Silage—					
Barley	26·0	1·8	12·7	·9	1 : 8·3
Clover	28·0	2·0	13·6	1·0	1 : 8·0
Cocksfoot Grass	23·0	1·1	10·6	1·0	1 : 11·9
Maize	24·6	1·8	13·5	·6	1 : 8.3
Oat	28·0	1·5	14·8	·9	1 : 11·3
Roots, &c.—					
Apples	19·2	·7	16·6	·4	1 : 25·1
Beet, leaves	12·0	1·7	4·6	·4	1 : 3·2
Beet, pulp	10·2	·6	7·3	·0	1 : 12·1
Beet, Sugar	15·7	1·6	11·9	·1	1 : 7·6
Cabbage	15·3	1·8	8·2	·4	1 : 5·1
Carrots	11·4	·8	7·8	·2	1 : 10·4
Mangolds	9·1	1·1	5·4	·1	1 : 5·1
Parsnips	11·7	1·6	11·2	·2	1 : 7·3
Pie Melon	7·15	·7	3·5	·6	1 : 7·1
Potatoes	21·1	·9	16·3	·1	1 : 18·4
Pumpkins	9·1	1·0	5·8	·3	1 : 6·5
Rape	14·0	1·5	8·1	·2	1 : 5·7
Turnips	9·5	1·0	7·2	·2	1 : 7·7

Feed Stuffs.	Dry Matter in 100 lbs.	Digestible Nutrients in 100 lbs.			Nutritive Ratio.
		Protein.	Carbo-hydrates.	Fat.	
Hay—					
Barley	91·5	5·8	43·1	1·6	1 : 8·1
Clover, Red	84·7	6·8	35·8	1·7	1 : 5·8
Cow Pea	89·3	10·8	38·6	1·1	1 : 3·8
Lucerne	89·1	12·3	37·1	1·6	1 : 3·3
Oat	89·9	4·5	43·7	1·5	1 : 10·5
Rye Grass	86·0	6·1	37·8	1·2	1 : 6·6
Vetch	88·7	12·9	37·5	1·4	1 : 3·1
Wheat	91·2	3·6	46·1	1·1	1 : 13·5
Straw—					
Barley	85·8	·7	41·2	·6	1 : 61·0
Oat	90·8	1·2	38·6	·8	1 : 33·8
Pea	86·4	4·3	32·3	·8	1 : 7·9
Soya Bean	89·6	2·3	40·0	1·1	1 : 18·5
Wheat	90·4	4	36·3	·4	1 : 93·2
Grain and Seeds—					
Barley	90·0	9·6	63·5	2·1	1 : 7·1
Cow Pea	85·2	18·3	54·2	1·1	1 : 3·1
Maize	89·4	7·8	66·7	4·3	1 : 9·9
Oats	89·0	9·2	47·3	4·2	1 : 6·2
Rice	87·7	5·3	67·6	·3	1 : 12·8
Soya Bean	89·2	29·6	22·3	14·4	1 : 1·9
Sunflower	92·5	12·1	20·8	29·0	1 : 7·7
Wheat, old	91·7	13·7	47·6	1·4	1 : 3·7
Products—					
Brewer's Grains, wet	24·3	3·9	9·3	1·4	1 : 3·2
Cocoanut Oil Cake	85·9	16·4	42·2	9·1	1 : 3·9
Dried Blood..	91·5	52·3	·0	2·5	1 : 0·0
Linseed Meal	89·1	26·1	38·5	6·5	1 : 2·0
Maize Meal	88·0	8·4	66·3	3·4	1 : 11·6
Malt Combing	94·7	26·1	50·6	1·5	1 : 2·0
Oat Branning	95·4	14·9	51·8	7·9	1 : 4·8
Pea Meal	89·5	16·8	51·8	·7	1 : 3·2
Peanut Meal	89·5	49·9	22·8	6·9	1 : 0·8
Wheat Bran	88·3	11·2	42·2	2·5	1 : 4·3
Pollard	88·3	12·2	53·4	3·8	1 : 5·1

MEDITERRANEAN FLOUR MOTH.

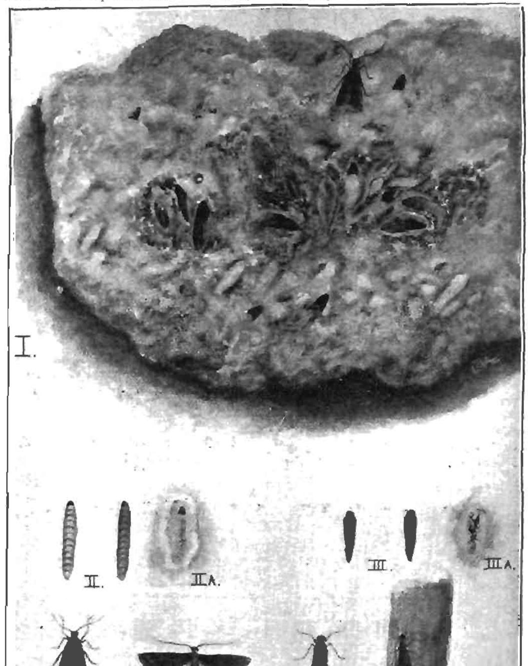
(*Ephestia Kuhniella*, Zeller.)

C. French, jun., Assistant Government Entomologist.

The Mediterranean Flour Moth is without doubt one of the most serious of insect pests that have troubled millers in all parts of the world. It has obtained a firm hold in many flour mills in this State, and is spreading rapidly. One well-known miller, in a letter to me, says—"I am endeavouring to cope with the Flour Moths as they appear. All hands have been instructed to kill them. I go round the mill every morning and put up a score for the men to beat. We average 1,000 moths per day. I think by this means we will keep them under."

The larvæ of these moths work in the bags of flour and form coverings over themselves. These coverings or webs sometimes fill the machines, with the result that it is necessary to stop operations and clean out. The

delays cause no end of trouble to the millers and, in addition, the excreta from the caterpillars has a tendency to slightly discolour the flour.



L. C. VALT ANDERSEN, DEL. C. FRENCH, DIREXIT

MEDITERRANEAN FLOUR MOTH.

(*Ephestia Kuhniella*, Zeller.)

The webbing also clogs up the elevators and spouts, and even the pulleys in some mills are a solid mass of webbing.

According to various writers on Entomology, the life history of this moth is as follows:—The eggs hatch in six days and the larvæ live about a month, when they pupate. They exist from one to three weeks or longer in the pupal stage, according to the temperature, after which they change to the perfect moth. The average number of eggs laid by the moth may be roughly estimated at a hundred. In some latitudes, there are five broods per year; and in warmer latitudes more. Based upon these facts, we find that at the end of the season one female moth may become the ancestor of 625,000,000 in the fifth brood, not counting those in the four preceding broods.

The principal means of spreading this destructive insect is through old grain sacks. Before being taken into the mill, sacks should be shaken up loosely and thrown into a tank of boiling water and allowed to remain in same for a quarter of an hour. Failing this treatment, the sacks should be fumigated with bi-sulphide of carbon, or hydrocyanic acid gas. The boiling water is, however, the simplest and cheapest method. The hydrocyanic acid gas treatment of infested mills has proved very successful, but great care must be taken in its use; the fumes from it are deadly. Any person who intends fumigating with it should first communicate with the Entomologist, and obtain full particulars as to the quantity of cyanide of potassium, &c. Bi-sulphide of carbon has also been used with good results, but it has a tendency to make the flour sticky and, when it is in sacks, the flour adheres to them. When fumigating, all openings should be sealed up, so that the fumes cannot escape. Great care must be taken that no light is used in the buildings during the course of treatment. When finished, open all doors and windows so as to admit the fresh air. It would be advisable not to enter the mill until all the fumes are gone.

EXPLANATION OF PLATE.

I. Flour showing clusters of cocoons, pupæ, and perfect insect.
II. Larvæ.
IIa. Larva in cocoon.
III. Pupæ.
IIIa. Pupæ in cocoon.
IV. Perfect insects.
V. " " resting.

Natural size. From Nature.

Since the foregoing was written, Mr. W. W. Froggatt, Government Entomologist of New South Wales, has contributed a most interesting article on the same subject to the *Agricultural Gazette of New South Wales*. Millers, especially, are strongly advised to read it.

TOBACCO CULTURE.

T. A. J. Smith, Tobacco Expert.

(*Continued from page 753, Vol. VIII.*)

SEED BEDS—*continued.*

The time for sowing seed will depend on the climatic conditions under which the grower is living, but, as a general rule, the first beds should be seeded in very early spring. It is wise to have early plants in case a dry early summer follows, but the old practice of sowing beds in the first week of July, especially in the Ovens and King River valleys, is a mistaken one. Tobacco seed will not germinate until the soil warms. Consequently, seed sown before the winter is over will simply remain dormant until suitable warmth causes them to germinate; even if they do start to

grow, and a cold change follows, they are liable to a check which is not good for a tobacco plant at any time.

Meantime, weeds will grow and a fair amount of labour will be required to keep the beds clean. Further, beds sown in the first week in August will provide plants generally as early as those seeded a month earlier. As before stated, the seed will take from ten days to six weeks to germinate, according to the weather and heat conditions, which fact alone explains the fallacy of too early sowing.

There is, however, one very important system in connexion with sowing seed beds which is not given the attention it deserves by Victorian growers; and that is, the necessity for sowing late beds in order to make sure of a crop in the event of any disaster overtaking the earlier sown beds. An unexpected late frost, or heavy hailstorm, or worse than either, the one serious disease known to tobacco growers in this State—Blue Mould—may make a clean sweep of the plants, and leave the grower without the means of producing a crop. This disease, of which more will be said later on, makes its appearance in cold wet changeable weather followed by humid muggy conditions, generally attacking the plants just previous to, or when they are ready to transplant. Many treatments have been tried, both in respect to the soil in which the plants are grown and also to the plants themselves, with the object of finding a cure, or prevention, without success. The only reliable system is to seed fresh beds directly the disease appears so as to have later plants to take the place of those destroyed.

Beds can be sown up to the first week in November with a good chance of the plants being of use; but one relay of beds should always be sown about the end of October, whether the mould has appeared or not, in order to be on the safe side. In warm weather, plants can be raised in six weeks, ready to transplant, especially if quick-growing varieties are used, such as, Hester, Conqueror, and Comstock.

The Mould, which nearly always makes its appearance in seasons that are conducive to developing rust in wheat, seldom attacks the very late plants. As it is possible to transplant up to the end of the year, and into the middle of January in some districts, it will be seen that the precaution of sowing late beds should not be neglected. In some seasons, Blue Mould but slightly attacks the plants the leaf only being affected. When this occurs the beds should not be watered, but the sun should be allowed free access to the plants and they will, *provided weather conditions are suitable*, often recover. The heart of the plant will be found to make fresh growth and fresh roots appear. Some of the plants should be examined carefully, to ascertain whether the disease has gone too far for successful transplanting, by pulling some and cutting across with a sharp knife at the junction of the stem with the root. If a brown or black ring be found inside the plant, it is useless to transplant, but, if the majority are clean and healthy the balance of the plants can be put out in the field.

Late transplanting has its advantages as well as disadvantages. Amongst the former we find that, where plants are put out in the field towards the end of December, they are less subject to cutworm and caterpillar pests. Also, there is less work with weeding and the quality of the leaf grown is generally better owing to the fact that the crop is less liable to a check from cold weather than when transplanted early.

The disadvantages are that, unless the ground has been carefully prepared and cultivated, there will be insufficient moisture and watering will

be necessary, and, in districts where early frosts, say in April, are prevalent, there is danger of loss from that cause. The yield per acre also is somewhat lighter, owing to the necessity for cutting some of the tobacco before it is thoroughly ripe. The difference in the yield may amount to 2 cwt. per acre, but the saving in labour in weeding, cultivation, and attention to insect pests, can be set off as against the loss of weight.

The time to water seed beds is much discussed by growers. The Chinese believe in watering both in the morning and evening, but many European growers prefer the evenings only. The latter, I think, is the safer plan. Watering in the morning under a hot sun causes a steamy condition liable to cause mould; and also scald the plants to some extent. There is also a quick and heavy loss of moisture by evaporation. If the beds are covered with straw, or hessian, watering in the evening is best, and no fear of a chill need be anticipated if care is taken not to water in very cold weather. If possible it is better to use water from a running stream in preference to stagnant or well water. The use of liquid manures is not advisable, unless it is necessary to facilitate the growth of backward plants. A safe system is to water only when the plants show signs of drooping. This will insure hardier plants. This applies to plants half grown; only very young plants require the soil kept continuously moist.

PREPARATION OF THE SOIL BEFORE TRANSPLANTING.

This is a matter that is of great importance for tobacco growing in our climate. When it is remembered that tobacco is a summer crop, growing only through the four hottest months of the year and that these four months are, generally speaking, the period of least rainfall, too much attention cannot be given to the conservation of moisture in the soil, especially where late planting is followed. We do not enjoy the same regular rainfall that is prevalent in Sumatra and other leading tobacco countries, during the summer months. At the same time, tobacco is successfully produced in some places where the rainfall is very light. In the season 1908-09, a fair crop was grown in the King and Ovens valleys, the rainfall from the 17th of October to the end of March being under 3 inches. Further crops have been produced with practically no rainfall during the growing period, without assistance from irrigation. Such a result can only be brought about by a thorough system of cultivation before and during the growth of the crop.

The field in which it is intended to grow tobacco should be cleared of all trees that are liable to shade the crop too much. All dead trees recently ring-barked should be removed as the falling dry limbs are liable to break down the growing plants; to say nothing of the danger to the men working under them. Stumps left in the field will not interfere with the crop, but are a considerable nuisance when ploughing, transplanting, and hoeing between the rows.

Fallowing, either in the autumn or early spring, should be practised for various reasons. Tobacco likes a sweet condition of soil, and will not grow so readily, nor produce as good quality, in an acid soil. A fallow, when possible, should therefore always be given to the land. Again, seeing that it is a summer crop, all the moisture that can be stored up in the soil should be conserved and the fallow will more readily admit the rains of winter and spring. Directly the warm weather sets in, a cultivator, harrow, or plough should be used to keep the surface loose and prevent evaporation, which, as Campbell, in his work on Dry Farming, states, will take place at the rate of a quart to a quart and a half per

square foot in twenty-four hours, equal to about half-an-inch of rain per acre per day.

Constant working of the surface soil, in order to keep a friable condition to a depth of two or three inches, will break the rising soil moisture by capillary movement to the surface, and thus prevent evaporation. The growth of weeds will also be prevented and the larvæ of insect pests destroyed; while the sweetening effect on the soil, by admitting air and sunshine, will be greatly improved.

Tobacco is a fairly deep-rooting plant; consequently, it is advisable to plough deeply where the surface soil is sufficiently deep to allow of such a practice. This will make a better water storage and enable the plant to send its roots down more easily to the subsoil, and thereby enable it to obtain a better supply of moisture during a dry period. The surface roots of the plant are the main feeders, however, and cultivation after planting must be shallow.

Just previous to transplanting, it is wise to plough about 5 inches deep, and harrow immediately after the plough. That is to say, after ploughing in the morning, be sure to harrow before leaving the land exposed to the sun during the dinner hour; also harrow the newly ploughed land in the evening before leaving for the night. This will keep the soil moisture in and the land will be found to harrow down much better. Some growers run a light roller over the land after the harrow and just before planting. This will certainly leave the ground looking nice; but if the roller is heavy enough to leave a caked surface on the soil, it is better either not to roll at all, or if the roller has been used, to run a set of light harrows over afterwards.

(*To be continued.*)

IRRIGATION.

G. H. Tolley, Manager, Wyuna Irrigation Farm.

(*Continued from page 689, Vol. VIII.*)

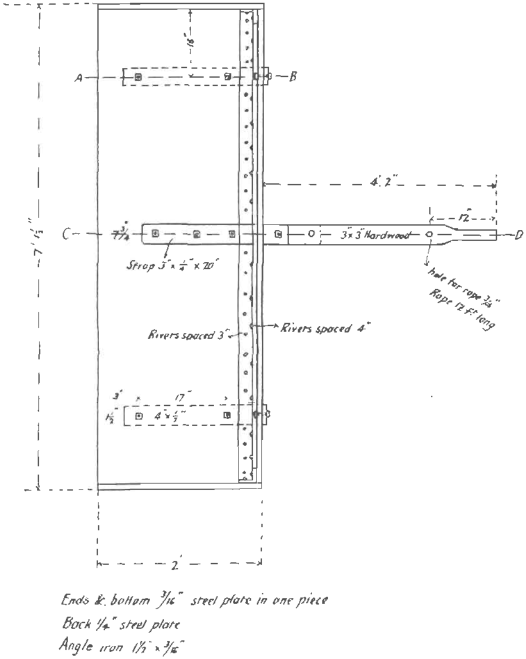
GRADING AND SMOOTHING.

The next operation is grading and smoothing the surface, and to any one proposing to irrigate without doing this I say most emphatically, don't. With a well graded surface most of the toilsome mucky work of irrigating disappears. There will always be some, and the irrigator should save his old boots and make up his mind to wet feet.

Having now brought the land to a fine tilth, set out the pegs and taken the levels, as previously described, mark on each of those pegs the amount of cutting and filling required, or dab them with black or white paint respectively. It is a ready guide to the grader, and saves reference to the plan. In most of the Goulburn Valley soils very little grading is permissible; the subsoil is too near the surface, and it might perhaps be more correct to refer to it as smoothing. In the great majority of cases this is really all that is necessary, and therefore the expense is light. And in that connexion it is well to remember that when it is once done it is not very likely that much subsequent work will be necessary. When it is required, it is generally in the case of filled-in crab holes and other depressions which, unless well crowned up, will invariably sink after a few irrigations. Where low crab-holey ground is to be treated, it is good practice to take off two or three cereal or other crops first. The constant stirring of and traffic over the land, and the accumulation of

stubble and wind-blown matter in the depressions, go a long way towards filling them naturally, and therefore there is less shifting of an already shallow soil. Grading for orchards where irrigation is by means of furrows need not be quite so perfect as when an area is to be flooded.

There are many tools suitable to the work, chief amongst which is the buckscraper, and a little study of the plans, specifications, and photographs here given will explain the *modus operandi*. An expert user of

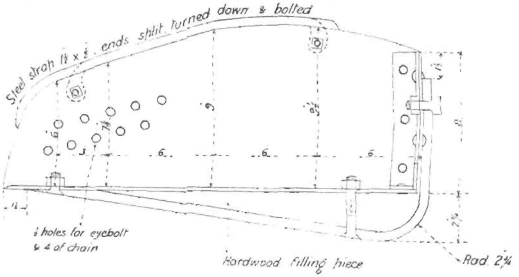


24. STEEL BUCKSCRAPER. SEVEN FEET SIZE. GENERAL PLAN.

the machine will in many cases require no other tool whatever. Primarily, it may be described as a widened scoop, but it has this advantage that when being emptied the spoil may either be dumped as in scoop work, or spread in a film evenly over the surface to such depth as may be required, or as the skill of the operator will permit. The chief knack in using the machine is in the manipulation of the handle and rope. For forming

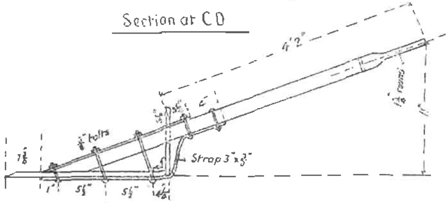
roads, banks, and shallow channels it is the most efficient tool I know of. Made in steel it costs £7, and in wood £6.

The buckscraper is worked with four horses coupled in pairs to facilitate slewing. Usually two men are required, one to drive the team and the other to operate the machine, but an expert with a steady team of horses used to the work will manage it by himself. Raising or depressing the handle will regulate the depth of cut taken and when the scraper is full it can be hauled to wherever filling is required. It is then raised to practically a vertical position when the more the handle is allowed to incline towards the team the greater the amount of spoil tipped, and *vice versâ*, the amount of incline being regulated by means of the rope. It



25. BUCKSCRAPER. SECTION AT A.B.

will be noted in the drawings that there are several bolt holes provided for regulating the draught and a few trials will soon discover which point will best suit the work. A very small change in position makes all the difference in comfort and efficiency of working.



26. BUCKSCRAPER. SECTION AT C.D.

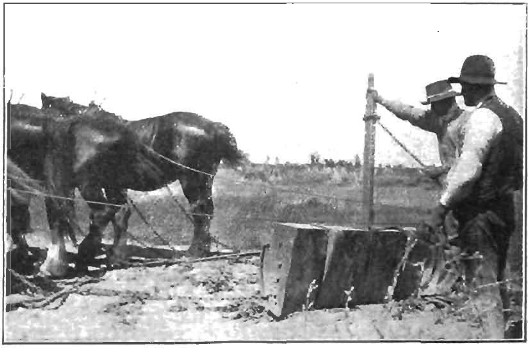
In grading work where several inches or feet of soil have to be shifted there is no cheaper or better method, and I have had cases in the Mallee where it became necessary to shift from 3 feet to 5 feet of the surface, and without doing any injury. Larger or smaller sizes can be had from the makers.

Following the scraper comes the smoother, and this will be the tool most generally used, if not the only one. Plans, specifications, and photographs of the machine at work will, it is hoped, make the working clear.

It is drawn by four horses coupled in pairs, and costs in steel £5, and, in wood, £3 15s. It will be noticed that the cutting edge is set at an angle like the blade of a plane; in fact, the machine may be called an earth plane. For the benefit of the farmer who may decide to make

27. BUCKSCRAPER. FILLED.

his own smoother I would ask particular attention to this angle or certain disappointment will follow.

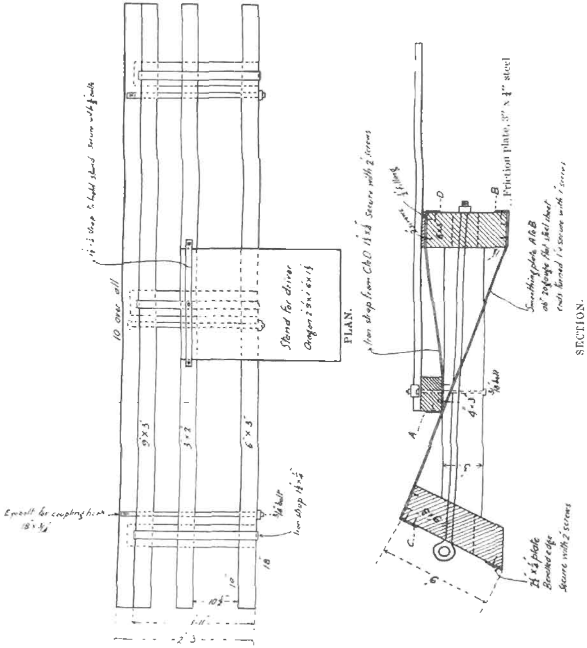


26. BUCKSCRAPER. TIPPING AND SPREADING.

The whole of the work is done by the driver moving his weight backwards or forwards along the platform. When a good "bite" is wanted he comes as far forward as possible, and according to the amount of earth to be dropped, so he regulates his movement to the rear; a sudden step to

the rear releasing all the earth at once as when forming check banks. It requires some little practice to properly perform these balancing movements, but the art is soon acquired.

Another form of smoother is shown in the photograph on page 60, and, as will be seen, is built on the louvre principle, possessing several cutting edges. As a smoother pure and simple it is a most effective implement,



29. BYRNE WOODEN SMOOTHER.

and is easily regulated by means of conveniently arranged levers, and is made in various sizes to suit the strength at command. There are many other types of these machines on the market, but for general purposes, either of the two described may be confidently recommended, according to the nature of the work required.

Forming check banks is a most important phase of the work, and it will be found that there are very few cases where some kind of check or

series of checks is not required. The forming of checks is generally the last operation in grading, and in order to make them neat and effec-

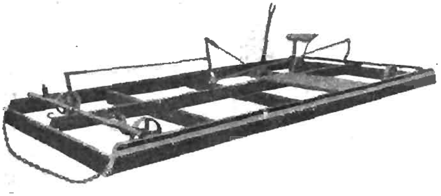
30. SMOOTHER. WITH LOAD READY TO SPREAD OR DROP.
Note the platform behind the man on machine.

tive, their positions, when determined, should be marked out with a single shallow furrow in order that they may be plainly visible to the grader. Where possible, the checks should be made parallel to each other, and also to one side of the field, to facilitate the work of the implements used

31. SMOOTHER. EARTH DROPPED TO FORM CHECK BANK.
The man is now standing at rear end of platform.

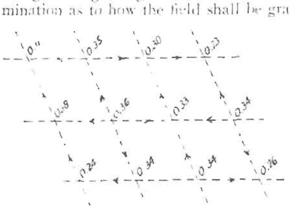
afterwards for harvesting, and also to simplify their construction. It is rarely that there are not some surface inequalities left, even with the

best of grading, and these are most effectively dealt with by the passage, backwards and forwards across the whole of the field, of the smoother during the building of the checks.



32. LAND LOUVRE GRADER.

Drawing No. 34 on page 61 will more clearly illustrate what is meant. It indicates a field marked out ready for grading and making the checks when the general grading is finished. To facilitate arriving at a final determination as to how the field shall be graded, level contour lines are drawn, mostly at intervals of 3 inches change in elevation, and a graphic representation of the surface is obtained, from which the lay of the land is obvious without reference to the figures. Where the lines approach closely, there the fall is quickest, and *vice versâ*. These lines are located by assuming that the surface inclination between contiguous pegs is regular and arriving at the position proportionately. A little study of the drawing will make this apparent. It is an assistance also in arriving at a conclusion to mark a series of arrow-heads along the dotted lines, in the direction of the fall. When they do not continue in one direction, some earth must be removed until they do.

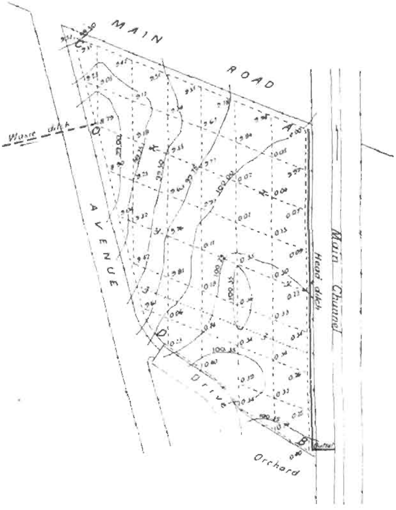


33. FALL, INDICATED BY ARROW HEADS.

By starting with the smoother from the point A and working straight towards B and returning over the same route, the whole surface is traversed. The checks at XYZ are formed during the operation by picking up a thin film of earth from the surface between the checks and depositing it at the furrows. This film will be greater or less in places, according to whatever slight irregularities of surface may remain, and the quantity will be subject to the judgment of the grader. Upon the first passage of the smoother from A to B the loads deposited at XYZ will appear as shown in No. 35, and upon the return journey the check will be completed and appear as in No. 36, and present no obstacle afterwards to the passage of implements.

The check can be made such height within limits as the operator may think desirable, but as a general rule 6 inches is enough, and this after a few irrigations and harvestings will consolidate to about 4 inches.

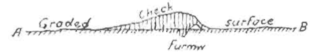
Another advantage of making checks in this manner is that the whole surface may be sown. Many people are in the habit of sowing first



34. FIELD SET OUT FOR GRADING.
Interval Check Banks marked X., Y., Z.

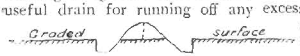
and making their checks afterwards by ploughing two furrows, backing one up against the other as in No. 37. It is most unsightly and ineffective, water is wasted in the furrows, the area sown is diminished, the passage of implements is at least hindered, time is lost in harvesting through having to deal with the areas between checks separately, and, lastly, the crown from want of consolidation is gradually washed and trodden into the furrows until it disappears.

In the drawing under consideration, the head ditch (deriving its supply from the main channel running parallel with it), is shown along the side marked AB, the land was graded flat between the checks and so that the direction of flow of water is westwards. Other check banks were made along the sides AC, CD, and BD, and as the boundaries there were fenced another method of making them was imperative. Two furrows were ploughed along these lines and the checks thrown up by means of the crowder, which will be described later. The machine was run along the furrows twice and very little shovel work was afterwards necessary to make a perfect job. This left an open furrow or ditch running along three sides of the plot and outside thereof, and serves as a useful drain for running off any excess water, which from the levels shown, will be noticed to concentrate at the point O and escape into the waste ditch there provided.



35. AFTER FIRST PASSAGE OF SMOOTHER.

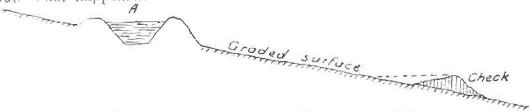
36. COMPLETED CHECK BANK.



37. UNSATISFACTORY CHECK BANK.

There is much misconception as to the proper location of checks but, generally speaking, they should lie at about right angles to the contours,

and parallel with the direction of flow of water. If the ground is very flat, transverse checks may also be desirable. Not long since, a case occurred where a land-owner called in a qualified engineer to design a scheme for grading and irrigating a considerable area preparatory to its being laid down to lucerne. The work was well done with the one exception of locating the checks and, unfortunately, the error was not discovered until the owner began to irrigate. The land possessed a moderate slope and the checks were placed along the face of it and at right angles to the flow of water. The sketch showing the ground in section will illustrate what happened.



38. RESULT OF WRONG LOCATION OF CHECKS.

The water was let in from the head ditch at A and when it reached the check it simply filled up to its natural level as shown by the dotted line, not only not doing an atom of good but super-saturating the submerged land and drowning the lucerne. On slopes such as these, where a body of water would travel fast, it is good practice to water slowly with a small stream to secure a good wetting. And to help to that end the seed should, if possible, be drilled in at right angles to the flow. When the plants are grown a little they offer a good check to the water and assist very materially in insuring even distribution. To grade land well, or even to grade it at all, has been the despair of many a farmer who otherwise would have become a successful irrigationist, and it is to this fact that much of the neglect to fully utilize our stored waters is to be attributed. There are few jobs calculated to break a man's heart so quickly as irrigating an ungraded or badly graded tract of land and, owing mainly to want of facilities for learning the whole art of practical irrigation, many desirable aspirants shrink from incurring labour and expense, the success of which appears to them so doubtful.

My advice to any individual contemplating the development of country under irrigation is to place no reliance upon any man who may be competent only to determine levels and lay out lines of channels, but preferably and even at greater expense to secure the services of some specialist who has had the benefit of thorough practical experience. The initial expense may be higher than most farmers care to face; but, seeing that a well-graded paddock will require no further expenditure for a number of years and that its irrigation is rendered a comparatively easy task, there should be no hesitation about securing the best assistance available.

(To be continued.)

ORCHARD AND GARDEN NOTES.

E. E. Pescott, Principal, School of Horticulture, Burnley.

The Orchard.

During the months of January and February the soil surface should be kept in as loose and friable a condition as possible. The work will be extremely easy this season, owing to the frequent rains that have occurred. The surface must not be allowed to become hard or caked; and, to prevent

this, the harrows and scarifier will need to be in constant use. The surface should also be well cultivated as soon as possible after each irrigation. By these means a good supply of soil water is retained and the trees do not suffer during any stress of hot or windy weather. The orchard should be kept free of weeds and useless growths; all suckers should be hoed out, and nothing left that would rob the trees of any moisture whatever.

Where the orchard is irrigated, a good watering should be given to the trees after each picking, so as to improve the quality of any fruit remaining on the tree. Unless the soil is well drained, a heavy flooding should not be resorted to.

SPRAYING.

The Codlin Moth is prevalent this season, and spraying for this insect will require to be very thorough. A spraying should be given during the second week in January, and another in a month's time. All infected fruit should be picked from the tree or gathered from the ground and destroyed by boiling. It is a common practice among orchardists to place the infected fruit in heaps, and attempt to destroy the larvæ by building a fire on top of the fruit. This method cannot be too strongly condemned, as it is almost inevitable that a number of larvæ will escape. The only way to properly deal with such fruit by burning is to have it burned in a furnace: failing this, boiling is the surest method of extermination when the larvæ are in the fruit. The caterpillars and chrysalids should be searched out of their hiding-places, under the bark, in the crevices of the tree, &c. All bandages should be well cleaned, and no chance whatever given to the insects to develop into the second brood.

Further analyses of various brands of Arsenate of Lead were published in last month's *Journal*, and the grower is always advised to study these figures before purchasing his spraying material. In South Australia, an Act has been passed to regulate the sale of insecticides and fungicides. The provisions of the Act are on the same lines as the Artificial Manures Act now in force in Victoria. That there is a necessity for this, not only in South Australia, is shown by the fact that, during the present season, as well as previously, complaints have been received of injuries done to trees as a result of spraying with various mixtures now on the market. The Act provides that a standard may be fixed, both minimum and maximum, for all insecticides or fungicides; for the issue of an invoice showing the percentage of any ingredient, and for the publication of analyses. By these means it is anticipated that a much better quality of spraying mixtures will be placed on the market.

Owing to the cool weather experienced during this season, Woolly Aphis is becoming abundant, particularly in sheltered situations. It is advisable to free the trees as much as possible of this pest now; as, if left till the winter, it will destroy a large number of buds on the tree. A strong tobacco solution, any lime spray, resin wash, or kerosene emulsion, will easily kill the insect.

FUMIGATION.

Citrus and other evergreen trees that are attacked by scale insects should be freed from the scale at this time. Although spraying with such mixtures as resin compound, crude petroleum emulsion, sulphur, lime, and salt

emulsion, will do good work in keeping scale insects in check, the only effective means of complete eradication is by fumigation. The trees are enclosed in a tent that will prevent the escape of any gas through its texture. The gas is generated inside the tent, and the tent is kept over the tree for a period of from half to three-quarters of an hour. The best remedy is hydrocyanic acid gas, which is generated by placing cyanide of potassium in a mixture of sulphuric acid and water. Both the cyanide and the gas are deadly poisons, and every care should be exercised in using them.

BUDDING.

January and February are the best months for carrying out budding operations. In budding, the work should not be performed unless the bark separates very freely from the wood; all cuts should be perfectly clean and free from rags and fibres. After a lapse of three or four weeks after budding, the ties may be cut, and the bud may either be allowed to start into new growth by cutting away all wood above it, or it may be left dormant until the following spring. It is generally conceded that a better and stronger tree will result if the bud is allowed to remain dormant during the winter, as the time of growth is too short to produce a good result in the autumn.

Vegetable Garden.

Keep the surface continually loose, hoe out all weeds, mulch when necessary, and give abundant supplies of water to growing plants.

Manure and dig over all vacant plots for succession crops; plant out seedlings of cabbage, celery, cauliflower, lettuce, &c., and plant seeds of peas, cabbage, cauliflower, turnip and leek.

In watering at this time of the year, a better result will be obtained if an occasional overhead spray is given.

A planting of potatoes may be made for an autumn crop.

Flower Garden.

As in the orchard, the principal cultural operation is the work of keeping the surface in the condition of a constant earth mulch by hoeing. The surface should be frequently hoed, and it will be found that the more cultivation is given the less water the plants will require. Mulchings, in the shape of manure, straw, grass, clippings from lawns, &c., may be used on the flower beds. Mulchings should not be used indiscriminately, the requirements of the plant being considered before the mulch is applied. If the plant is entering upon a period of rest, such mulchings as grass or straw may be used. Manure should not be used as a mulch unless it is intended that the latter should be a stimulant as well as a protection for the roots.

All tall-growing plants, such as chrysanthemums, dephiniums, and dahlias, should be staked so as to protect them from winds; they should be well mulched and fed and their growth should be continued throughout. A sharp lookout should be kept for attacks on these plants of Red Spider; if this insect appears, a good spraying with tobacco solution or benzole emulsion should be given to the plants. Caterpillars of all descriptions should also be kept in check with Paris Green.

Gladioli may now be planted for autumn blooms; Iceland Poppy and Pansy seeds, also seeds of perennial and biennial plants may be sown.

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ONION CULTURE.

E. E. Pescott, Principal, School of Horticulture, Burnley.

In Victoria, during the season 1909-10, there were, under the cultivation of onions, 6,434 acres of land which produced 31,715 tons. These figures represent a record in onion production in Victoria. The official statistics date from the season 1855-6, when 38¾ acres produced 2,905 cwt., or nearly 76 cwt. per acre. The average product for the past season was nearly 5 tons, so that, since onion culture was first commenced in Victoria, the rate of production has increased to the extent of over 1 ton per acre. Onion-growing was, however, established earlier than the season mentioned. In 1854, the late Mr. Fred. Willey planted the first acre of onions grown in Victoria, at Bellarine East, near Portarlington. Part of the produce was sold in 1855 by his son, Mr. R. Willey, in Johnston's Auction Rooms, Geelong, and realized 12s. 6d. per ton. In the following year, Messrs. S. Hibbert, J. Walker, and A. Willey also started onion-growing; and, from this first acre at Bellarine, the onion industry has gradually spread throughout the whole State. At the present time, onions are still being grown in the vicinity, and on the identical spot, where the first acre of onions was planted in 1854.

The onion can adapt itself to a very wide range of climate and it should thrive equally well, provided the soil be suitable, throughout the whole of the State. It stands almost alone in vegetable crops in possessing the characteristic that it will grow successfully in the same soil for many years, without change of crop, provided that onion pests and diseases are not prevalent. As showing the productiveness of the Bellarine soil, there is one paddock in which onions were grown for thirty years continuously. Mr. R. Willey grew in one paddock seven successive crops of onions in seven successive years, and the seventh crop was the heaviest, averaging 18 tons per acre.

It is unfortunate that the onion eel-worm has obtained such a strong hold in the Bellarine soil, as there is no doubt that the district is second

to none for the production of onions; and land that would be worth £100 per acre for onion-growing is now only valued at from £35 to £40, owing to the devastating influence of this scourge.

SOIL.

Onions may be grown successfully in various types of soil, from a sandy loam to a heavy volcanic soil; a lighter loam is the better but the soil must be a rich one—the richer the soil, the better the crop. The success of the onion crop depends as much on the fertility of the soil as on anything else. Onions grow more rapidly on sandy soil, and thus a sandy soil will produce an earlier crop; but the bulbs grown on sandy soil do not possess the keeping qualities of those grown on the heavier type of soils.

PREPARATION OF THE SOIL.

The soil should be mellow, as clean as possible from weeds; and, if only of a medium character, it should receive a good dressing of well-rotted stable manure. The soil must be worked thoroughly, and it should be well drained; perfect soil drainage is an essential in successful onion production.

During winter there must be no accumulation or settlement of water, and means must be provided for the water to run away freely. Hence, sub-soiling should always be practised; the soil should be ploughed to a depth of about 7 inches, and deeper if it is necessary to get good drainage. Onions, and all other plants of the bulb family, cannot make reasonable growth, and will very readily rot in a cold wet soil.

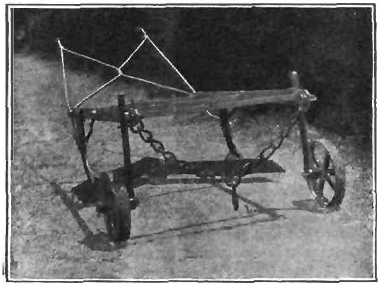
The onion is generally considered to be a surface feeder. All food supplies should therefore be readily and immediately available. To this end, the soil must be well pulverized, with the best possible surface tilth; and the seed-bed should be of as light a quality as possible before planting. After ploughing, the seed-bed should be well rolled, a good solid bed being necessary; this will prevent the onion bulb from becoming too deeply buried in the soil. Onion bulbs need plenty of light and air to allow them to properly develop. It will be often noticed that where onion bulbs are poor in character, or where the plant produces flower-heads, the bulb has been covered with the soil. In other words, the bulb has grown in the soil, instead of on the soil.

In some districts where the onion has been grown for years as a staple crop, an implement known as the "Skimmer" is very largely used for cultivation purposes. The skimmer is a product of the Bellarine district, and it is the outcome and result of many trials and experiments. It simply consists of two large blades which work parallel to the surface of the ground, either on the surface or at any depth to which the machine may be regulated for the various purposes required. The skimmer blades must be perfectly level; they are set back, cutting on a back slope, and are placed at an angle of 60 degrees from each other. The skimmer is particularly useful as a cultivating and weeding implement; it is also used for removing onion and other crops from the soil. In removing the onion crop, after skimming, a man rakes the onions aside, so as to allow the horse to work the next row. When the land has been deeply ploughed, some growers skim more frequently for subsequent crops than they plough; and thus, skimming being cheaper, the cost of production is considerably reduced. The general custom is to plough for two seasons and then skim for the third. With a large-sized skimmer drawn by two horses, weeds may easily be shaved out at the rate of 6 acres per day; a pea crop may be removed

at the rate of 5 or 6 acres per day; while the daily skimming of onions amounts to 4 or 5 acres per day. The cost of a skimmer is approximately £5.

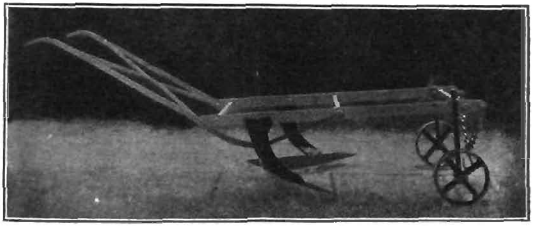
PLANTING AND CULTIVATION.

Onion seed must be fresh. Old seed will not germinate freely; nor can it be depended upon to produce strong growing, vigorous plants. The seed should be of the previous season's production. Bailey's experiments in longevity of seeds showed that onion seed of this age carries the greater percentage of sound seeds capable of freely germinating. Seed two years



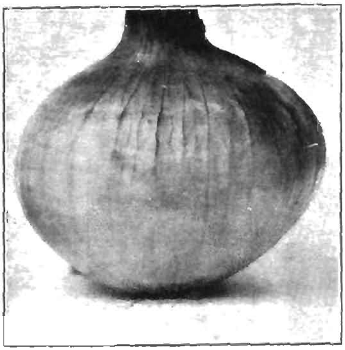
THE SKIMMER.

old germinated only at 56 per cent.; while of seed three years old, only 31 per cent. were vital. The fact that extra care should be exercised in the purchase of onion seed is shown by the result of a germinating test of some seeds that were recently forwarded for testing purposes to Professor Ewart by a seedsman to whom they had been supplied as good sound seed. The germination test gave the low result of only 2 and 3 per cent. of good seeds.



ANOTHER VIEW OF THE SKIMMER.

The "new" method of onion cultivation, which is largely in vogue in America, is to plant the whole of the onion seeds in seed-beds, from which the onions are subsequently transplanted into the onion fields. It is

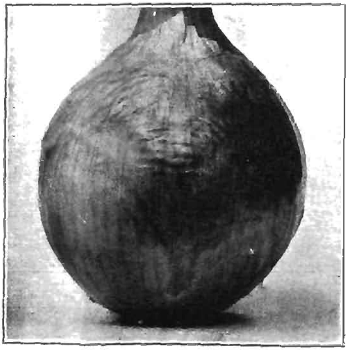


"AILSA CRAIG."

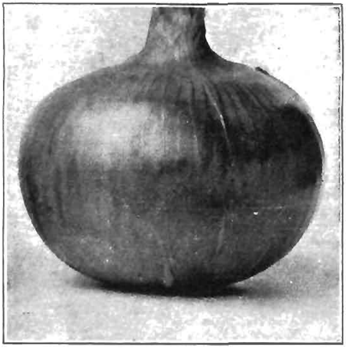
claimed that, by this method, far less weeding is required; and also that transplanted onions are quite immune from the attacks of the onion eel-worm. In transplanting, however, should any of the plants be bruised or crushed, and this is a condition that very frequently happens, the worm can readily effect an entrance through the wound into the bulb, and thus the very object of the "new" method of planting may be defeated.

In planting the seed in the open ground, the seed-bed must be well worked immediately before planting, and then rolled hard. The seed is planted in drills 9 inches apart at the rate of 3 lbs. per acre, and, if planted at this rate, no thinning will be necessary. Some growers prefer to thin, leaving a space of from 4 to 6 inches between each young plant, so as to allow the bulbs to expand evenly; other growers think there is no necessity for this, as it is considered that misshapen bulbs will generally improve in shape while the crop is curing. After drilling, the land should be well rolled, and a fortnight after rolling, the soil should receive a light harrowing. The young onions should begin to appear in a fortnight from planting. From the time the plants appear until they begin to dry off, the onion paddocks must be kept as far as possible free from weeds. If the seeds are planted in a seed-bed to be afterwards transplanted, the seed should be sown earlier than it would be if planted at once into the open ground.

In the southern parts of Victoria, the best time for planting the seed is the month of July. The seed may be planted in April and May and this will give early crops; but early planting will materially increase the



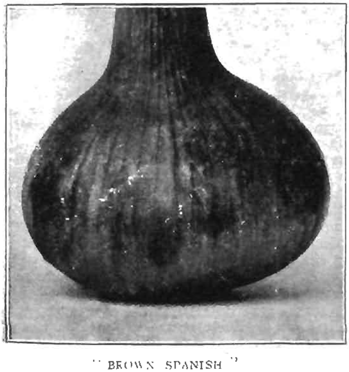
"SILVER GLOBE."



"EXTRA EARLY GOLDEN GLOBE."

cost of production, owing to the extra necessary weedings. If the winter is likely to be dry, May is a good month to plant; this gives the bulbs a good start and they get strong and sturdy before the dry weather sets in. In a late season, onions may be planted as late as August. In the Bellarine district, a few years ago, Mr. R. Willey planted a crop of onions in August, which subsequently gave the exceptional yield of 25 tons per acre.

Until the onions are ready to be harvested, the crop should be kept free from weeds. Hand-weeding in the rows is a necessity; but, between the rows, the weeding may be carried out by hoeing. If the weeds are allowed to remain any length of time, they not only combat with the onions for food and water supplies, but, owing to the crowding of the weeds, the onion plants become very weak and spindly. The hoeing not only removes the weeds, but creates an earth mulch and cool soil conditions, both of which are beneficial and necessary to the growing onions. Should the soil become hard and dry, the result will be to produce a poor crop.



"BROWN SPANISH."

FERTILIZING.

If the soil be rich and *rotation of crops* practised, very little fertilizing will be necessary. Onion land will always be benefited by the addition of a heavy dressing of animal manure, of about 30 to 40 loads per acre. Care should be taken that the manure has previously been well rotted, otherwise a considerable amount of trouble will be experienced from the weeds in the manure. In Colorado, animal manure is practically the only fertilizer used. In Idaho, nitrate of soda at the rate of 200 to 300 lbs.

per acre is largely used. This amount is fed to the crop in three or four sowings, at intervals of two or three weeks, the first application being made when the onions have grown to the size of an ordinary lead-pencil. The nitrate of soda is always applied during the growing season.

As the result of some extensive manuring experiments carried out at the New Mexico College of Agriculture, U.S.A., lasting over a term of five years (1905-9), it was found that the best manure for onions was nitrate of soda; an application of 300 lbs. per acre increased the crop by over 4 tons per acre. An application at the rate of 600 lbs. per acre increased the crop at the rate of nearly 8 tons per acre. In Northern Indiana, onions are principally grown in drained swamp lands, which are composed of rich black soil from 3 to 8 feet deep. There, 1,000 pounds of commercial fertilizer is used containing 5 per cent. nitrogen, 6 per cent. phosphoric acid, and 10 per cent. potash. Later on, dressings of nitrate of soda or sulphate of ammonia are given. In the Gulf coast States of America, onions are largely grown and the yield averages 300 bushels per acre. The fertilizer in use in those districts is composed of :—

Sulphate of Ammonia (25 per cent.)	200 lbs.
Dried Blood	300 "
Cotton-seed Meal	300 "
Acid Phosphate	800 "
Muriate of Potash (50 per cent.)	400 "

It will thus be seen that the necessary fertilizer for onions is one in which nitrogen predominates; at the same time, an occasional dressing with potash is beneficial. As stated previously, the onion is generally considered to be a surface feeder. Therefore, any chemical fertilizer used should not be ploughed deeply into the soil—all food supplies should be near the surface. At the same time, some growers regard it as a deep-rooting plant; and, on some volcanic soils which crack considerably during the summer, onion roots have been found at a depth of 4 feet from the surface.

VARIETIES.

The variety most extensively grown in Victoria is the Brown Spanish, which, in addition to its fine flavour, also possesses very excellent keeping qualities. An early variety of the Brown Spanish is now on the market, which has the reputation of ripening at least three weeks earlier than the ordinary kind. This variety has not been tried extensively in Victoria, but a small plot, which has been planted at the Burnley Gardens for trial purposes, up to the time of writing, shows this early variety to be true to its reputed characteristic.

The varieties which are largely grown in America are the Red and White Bermudas, for early onions, and Yellow Globe Danvers for general requirements; other varieties are Wethersfield, a medium large onion, red-coloured and strong-flavoured; Prizetaker, a large globe-shaped yellow onion of a mild flavour; Ailsa Craig, a very popular onion, large and handsome, of a pale brown colour, only a fair keeper, but a good exhibition onion; Spanish Silver Globe, a mild early onion, not possessing any keeping qualities; Early Golden Globe, one of the largest and a magnificent exhibition onion, ripening early and keeping well. Of the largest known onions, two Spanish-Italian varieties are grown; these are the Giant Rocca and the Flat Red Rocca, and both are particularly mild in flavour. One of the most popular onions in the Western American States is a variety known as Australian Brown. It is not definitely known in Australia what this variety is, but it is supposed to have originated from some seed sent to America from Australia, probably from seed of the Brown Spanish variety.

HARVESTING.

Onions are harvested from January to March, according to location. By means of the skimmer, the blades of which run along a couple of inches below the surface, all of the onions are removed from the soil. The onions are ready for harvesting when the tops begin to turn yellow and wither. Harvesting operations may be carried out when approximately two-thirds of the crop have reached that stage.

The practice of breaking down the tops gives no practical results, except that the bulbs mature earlier; and the idea that as a result of this, the sap will be restricted, and the bulbs will increase in size, is an erroneous one. In Nature's own time, the tops will bend over and so restrict the sap and keep it in the bulbs. In late districts, so as to harvest the crop before any excessive autumn rains set in, it may be necessary to break the tops by aid of a small roller, so as to hasten the ripening of the crop. In Arizona, and other central localities of the United States, it is the usual practice to break the tops, so as to get an early crop; it is considered that the loss from the reduced yield will usually be more than made up by the higher prices for an earlier crop. If the crop is at all backward, the tops may be broken to hasten the ripening; but it must be emphasized that the best onion crops are those that ripen without any artificial aid whatever.

After the skimmer has removed the crop from the soil, and the onions have been raked into rows, they are allowed to remain in the fields for several days to cure. The bulbs should not be left too long in the open as, if left on the ground until they are dry, the first or outside skin becomes hard and peels off. Should any seed-heads appear at any time during the growth of the crop, they must be broken out, as they render the quality of the bulb very inferior. After curing, the bulbs are stored in large crates, built for the purpose, or in barns. Stored onions should be kept thoroughly dry as any moisture will cause them to sprout and germinate.

PHOSPHORIC ACID IN RELATION TO AUSTRALIAN SOILS AND VEGETATION.*

T. Cherry, M.D., M.S., Director of Agriculture.

In the *Year-Book of Agriculture for 1905*, and, subsequently, in my address as President of Section G of this Association, at the Adelaide meeting, 1907, I attempted to formulate the results of our investigations concerning the chief chemical plant foods of the soils of Victoria. The present paper is an extension and amplification of the same investigations.

In generalizing about our soils, it must be remembered that large areas of extremely rich volcanic and recent alluvial soils do not exhibit the same characters in regard to phosphoric acid that we find in the soils of average fertility and productiveness. With this proviso, the general propositions laid down are—

(1) That nitrogen is relatively abundant, being present usually to the extent of .1 per cent., and often to double that amount. Except in districts of heavy rainfall (over 35 inches fairly evenly distributed throughout the year), it is present in forms very readily available for the plant.

* Paper read at Sydney meeting of the Australasian Association for the Advancement of Science—January, 1911.

(2) That phosphoric acid is singularly deficient, both in total amount and in the percentage readily soluble in weak acids. Generally speaking, there is not the same difference in the amounts present in the surface soil, and the subsoil as is found in typical soils in Europe and America. The average total amount is about .06 per cent.

(3) That potash is generally present in fairly large amounts, compared with the phosphoric acid, except on the recent alluvial soils near the sea coast. The amount present shows much greater variations than is the case with the nitrogen and phosphoric acid. Its average amount varies from .2 to .4 per cent., and even up to 1 per cent.

The results of the analyses of 702 samples of soil show that in 350 cases the amount of phosphoric acid is less than .05 per cent.; in 214 cases between .05 per cent. and .1 per cent.; in 74 between .1 and .15 per cent., and in 64 cases over .15 per cent. The area of the State, corresponding to soils exhibiting these various quantities of phosphoric acid, is not, however, proportional to the above numbers.

We have been working chiefly on the poorer soils, and, consequently, the number of analyses, with the percentage of phosphoric acid below .05 per cent., is correspondingly great. These poor soils are found chiefly in a number of areas of sandy land along the coast, and in the poorer portions of the Mallee. The greater part of Victoria is covered with surface soil running from .05 to .15 per cent. of phosphoric acid, while the volcanic and alluvial soils often attain percentages exceeding .15 per cent.

Although the amount of work done in this direction is not great enough to allow of wide generalizations, there is no doubt that the tendency is, with advancing civilization, for the difference between the surface soil and the subsoil to become more and more marked. This differentiation is due in the first place to the plant, and subsequently to the animal, but when plants and animals are directed and controlled by human agency, the process of differentiation proceeds at a much greater rate. I have already frequently pointed out that the roots of plants in foraging for phosphoric acid along with the other plant foods throughout considerable volumes of both surface and subsoil, bring about a process of concentration of phosphoric acid in their tissues. This phosphoric acid is chiefly found, first of all, in the growing parts of the plant, and, at a subsequent period, in the seed and its neighbourhood. Purely supporting tissues, such as the straw of ripened grain, and the wood of forest trees, contain very small percentages. The animal appropriates the phosphoric acid from the plant, requiring it to build up all its tissues. Finally, the phosphoric acid is, for the most part, concentrated in the bones.

How the animal acts as an additional factor, in concentrating phosphoric acid, is in this way: Every time a plant is browsed off a fresh attempt is made to secure sufficient nutriment to produce flower and seed. The consequence is that plants which are browsed upon by herbivorous animals are compelled to bring up much larger quantities of phosphoric acid to the surface than those which are allowed to accomplish their life cycle undisturbed. The animal thus compels the plant to bring up more phosphoric acid, and then concentrates the phosphates chiefly in the bones. When decay occurs the bones are slowly but surely incorporated in the earth. During the life of the animal a certain amount of phosphates are kept in continual circulation through being returned to the

surface of the soil in the excrements. As the phosphoric acid becomes available in increasing quantities, in the surface soil, the growth of plants is stimulated, and consequently larger numbers of land animals are carried on to a given area. It will thus be seen that the history of phosphoric acid in the surface soil is very similar to that of the phosphatic rocks, and also of most limestones. In the latter cases, the phosphoric acid and the lime have been slowly concentrated from the waters of the sea by the action of plant and animal life combined in the one case, and animal life alone in the other.

From observations that have been made on a more restricted scale in the other Australian States, there seems to be little doubt that what holds true in Victoria applies to Australia generally, as far as regards the small amount of phosphoric acid in the surface soil.

I take it that the small percentage of phosphoric acid in our surface soil is due to the fact that the Continent has never been heavily stocked by large animals of any kind. In Victoria we know that, previous to settlement by white men, the number of kangaroos and emus was much less than the number of sheep is at present. Taking the Continent all through, there seems little doubt, from the accumulation of the bones of existing and extinct species in the mud of many lakes in the interior, that periodical droughts have kept down the numbers of animals during recent geological epochs. In Victoria vast areas were so densely timbered that it is certain that herbivorous animals were never present in large numbers; for it is found that browsing animals keep down the forests, not by destroying the large trees, but by preventing seedlings from growing and taking the places of the forest trees which die from old age. In the case of the Island of St. Helena, this action has been sufficient to completely destroy the original forests in less than 300 years.

Adaptation of the Native Herbage to Special Conditions.

While carrying on the investigations into the phosphoric acid content of our poorer soils, I was struck by the fact that certain forms of native vegetation are found on nearly all the soils in question, and that allowing certain modifications for the rainfall one might form a very good estimate of the amount of phosphoric acid present in any given area by the vegetation growing thereon. The following table gives the percentage of phosphoric acid in a number of these characteristic plants:—

Name.	Moisture.	Calculated on Dry Basis.	
		Ash.	P_2O_5.
	%	%	%
Kangaroo Grass. (*Anthistiria ciliata*) ..	52·58	5·37	0·122
Tussock. (*Poa caespitosa*)	58·86	28·70	0·17
Bracken. (*Pteris aquilina*)	56·10	5·05	0·243
Buloke. (*Casuarina suberosa*)	49·72	4·23	0·081
Peppermint Gum. (*Eucalyptus amygdalina*) ..	49·37	2·48	0·169
Southern Grass Tree. (*Xanthorrhœa australis*) ..	61·30	2·640	0·129
Common Heath. (*Epacris impressa*)	39·83	4·347	0·139
Mountain acacia. (*Acacia montana*)	46·00	3·20	0·152
Wild Cranberry. (*Styphelia humifusa.*) Syn. *Astraloma humifusum*	36·55	4·78	0·162

In the above analyses the green leaves flowers and seeds were used for analysis, woody fibrous stems and roots being excluded, except in the case

of the Tussock Grass. The average composition of the corresponding parts of cereals, grasses, and cultivated plants of economic value would vary from .4 to 1.4 per cent. phosphoric acid, or nearly ten times as much. It would therefore appear that the native plants have established a kind of equilibrium in phosphoric acid with the soil. They require very little from it, and return to it correspondingly small amounts when they decay. It is quite possible that in Europe and America the animal has had a further action in determining the character of the soil, for by a process of the survival of the fittest, those plants which produced most phosphoric acid would be likely to be selected as food by the animal, and the struggle for existence being thus intensified amongst them, the more vigorous varieties would gradually be evolved. It appears then that native vegetation, when not interfered with in any way by the animal, neither produces nor requires as high a percentage of phosphoric acid in its tissues as is the case with those plants which have proved of the greatest economic value both to the higher animals and to man.

It appears to me that the results of the above analyses explain the occurrence of the bone diseases comprehended under the names of "Cripples" and "Coast Disease," which affect animals kept too long on "Kangaroo Grass," and similar grazing country. The native vegetation only contains one-tenth of the amount of phosphoric acid that Rye Grass, Cocksfoot, Lucerne, Clover and the cultivated cereals produce off the same soil. These facts also explain the general usefulness of phosphatic manures on Australian soils.

In five localities on the coastal plain, experimental farms have been carried on by the Department in order to investigate the problems of bringing these poor soils into profitable use.

It is necessary to state that a vast difference is found in districts of light and heavy rainfall where the chemical composition of the soil is nearly identical. In the former a crop can be grown successfully with a light dressing of superphosphates immediately after the scrub is rolled and burned. When the rainfall exceeds 35 inches, after the land has been drained, it requires to be exposed to the sun and air for two or three seasons before it is sufficiently sweetened to produce any satisfactory growth. The fibrous rootlets with which these sandy soils are filled decay very slowly. The soil is invariably acid, and the roots of the native vegetation seem to produce an exudate which interferes with the growth of other plants. At all events, in our experimental plots, seeds germinate, but although abundantly supplied with moisture, and artificially supplied with nitrogen, phosphoric acid, and potash, they fail to establish themselves after the food supply, contained in the seed, is exhausted. Lime and ashes help to rectify these conditions, but the only way in which they can be quickly overcome is by the addition of farmyard manure to the soil.

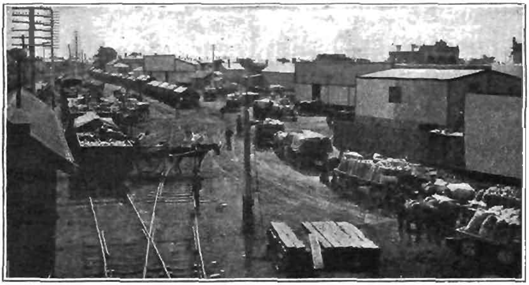
This undoubtedly acts by introducing putrefactive and other bacteria, which appear to be singularly deficient in the soil in its original state. Potatoes and mangolds are probably the first crops to give a satisfactory yield, oats and rye following next, and peas and beans being much more difficult to adjust to the new conditions. Finally, the experience of the past 60 years goes to show that the market gardeners in the neighbourhood of Melbourne have successfully solved all the difficulties of bringing such lands into profitable cultivation, and converting them into some of the most productive areas of our State. The results of our experimental work clearly indicate the lines along which success must be achieved.

EXAMINATION OF ARTIFICIAL MANURES.

W. C. Robertson, Deputy to the Chemist for Agriculture.

REPORT FOR YEAR 1910.

During the first months of the year the Yarraville railway station yard is a veritable hive of industry. It is an object lesson in method. The working space is very small for the traffic, yet one seldoms observes a pair of idle hands. Three of the largest manure firms in Victoria consign from this station and some thousands of tons of artificial manure are forwarded weekly. Everything runs smoothly; directly one lorry discharges its load another immediately takes its place and so despatch goes on unceasingly from early morning until late at night. Farmers and agents often complain of delay in forwarding consignments, but if they knew of the precautions taken to prevent disappointments and the difficulties in the way



DESPATCHING MANURE AT YARRAVILLE.

of prompt despatch they would be more reasonable. Some 1,300 tons of artificial manure were consigned from Yarraville on the day that the photograph on this page was taken. Inspection commenced in February at Yarraville where several consignments of manure were weighed and sampled.

The photograph on page 76 illustrates the manner in which the manure is weighed. The Salter spring balance, which is tested before inspection commences, is suspended from an iron tripod. The strap shown serves a twofold object, in that it is convenient, and at the same time avoids loss of manure through the tendency of manure bags to burst, owing to the action of the acid.

It is customary to weigh consignments at the time of departure because the manure is liable to dry out; if weighed in the country the weight found may be low. Several consignments, after being weighed in Melbourne, were followed to their destination and again weighed. The manure was three days in transit and afterwards lay on an up-country platform for two days. The temperature averaged 98° in the shade for the five days. The manure when originally weighed averaged 2 lbs. per bag over the

CHECKING WEIGHTS.

guaranteed weight; yet, five days later, it averaged 3½ lbs. per bag under weight, representing a loss of over 1 lb. per bag per day.

Farmers are continually weighing bags of manure and when the net weight is low, which is usually the case, they complain. Manufacturers guarantee weight at the time of analysis, *i.e.*, as the manure leaves the factory. A farmer obtaining a parcel of artificial manure is practically buying a definite quantity of phosphoric acid, and it matters not if the weight on arrival is deficient so long as the weight at the time of despatch is correct and the phosphoric acid content is not decreased. For example, a ton of ordinary superphosphate is sampled, analysed, and weighed, first in Melbourne and afterwards in the country, with the following result:—

Manure.	Weight per Bag.	Moisture.	Water Soluble Phosphoric Acid.	Citrate Soluble Phosphoric Acid.	Citrate Insoluble Phosphoric Acid.	Total Phosphoric Acid.
	lbs.	%	%	%	%	%
In Melbourne	190	12	17	1	2	20
In country	182½	8	17·77	1·04	2·10	20·91

The loss in weight is due to the evaporation of moisture, the result being that the producer bought a manure at a certain guarantee for £4 7s. 6d. per ton and received a manure with a higher analysis worth approximately £4 11s. 6d. per ton; the loss in weight, viz.:—7½ lbs. per bag, is equivalent to an increase in value of 4s. per ton.

Consignments of manures weighed at Yarraville gave the following net weights:—

Brand of Manure.	Net Weight Guaranteed.	Net Weight Found.	Monetary Value of increased Weight per Ton.
	lbs.	lbs.	*s. d.*
Florida Superphosphate	186⅔	191·6	2 5½
Wischer's Superphosphate	186⅔	192·8	3 1
Mount Lyell No. 1 Superphosphate ..	186⅔	192·8	3 1
Dissolved Bones	186⅔	190·0	1 8

It will therefore be seen that the manufacturer treated the producer very fairly in the matter of weight. In one instance only a manufacturer was detected giving short weight and he received warning.

The first country district visited was the Wimmera, then the area north of Bendigo, and finally the Gippsland and Western Districts; 131 samples, representing 494 tons of manure, were collected. Particulars are given in the following list :—

Manure.	Samples.	Tonnage Sampled.
		tons.
Superphosphate	36	250
Bonedust and Superphosphate	21	50
Bone Fertilizer	19	40
Bonedust	15	60
Nitro-Superphosphate	7	10
Blood	4	40
"Star" (Thomas Phosphate) and Superphosphate ..	3	5
Dissolved Bones	3	4
Various and Mixed Manures	23	35
	131	494

The various and mixed manures comprised samples of dissolved Peruvian guano, nitrate of soda, animal fertilizer, leguminous rape, special grain, potato, orchard and vine and maize manures, guano and Thomas or star phosphate. The majority of the samples of superphosphate, bonedust and superphosphate and nitro-superphosphate were obtained in the Northern Districts whilst the Southern Districts supplied practically all the bone fertilizers, bonedusts, blood and mixed manures.

The analyses of superphosphates collected agreed with the guarantees, *i.e.*, within the limit allowed by the Act. The tendency in the superphosphate manufacture, however, is to give a high content of insoluble phosphoric acid at the expense of the more valuable soluble compounds. As superphosphates are principally used in the dry districts of the North, where the value of a manure depends upon the percentage of the water-soluble constituent, this is rather a disadvantage.

The analyses of the samples of mixed manures collected were, on the whole, satisfactory, although in one or two instances the potash content was low.

The majority of the bonedust samples inspected were of good grade, especially those from country mills. In this section, however, there were five prosecutions.

The samples of bone fertilizer, a manure made up of bonedust, superphosphate, gypsum and rock phosphate and which is supposed to act as well as bonedust, being often sold as such, all analysed above the guarantee. It should be remembered by the producer when buying bone fertilizer that this manure cannot, at the price, be compared with bonedust. Bone fertilizers contain, at the most, one-third bonedust and not one of the ingredients which make up the remaining two-thirds is as valuable as this manure.

On the whole, as a result of the inspection and the analysis of the samples, it is satisfactory to be able to record that the manures supplied to the farming community during the year 1910 were of a very even standard. During the year several prosecutions for technical offences have taken place, whilst for lesser violations warnings were given.

Owing to two or three farmers lodging a complaint as to the prices charged for artificial manures, inquiries were instituted and it was found that in this district, which only possessed one manure agent, abnormally high prices were being asked for fertilizers; the price of a simple manure like superphosphate was £7 per ton. This is most unusual, and as the Chemist for Agriculture is empowered to supervise the prices charged the farmer, advice was tendered and the matter set right.

Some Popular Fallacies.

A few notes on questions asked by farmers and some popular fallacies existing amongst the tillers of the soil in reference to manures and the Manures Act may not be out of place.

When observing a farmer taking delivery of manure it is usual for the Deputy Chemist to ask him to produce the invoice certificate, which it is compulsory for the manufacturer, dealer, or agent to tender to the purchaser when making a sale or before delivery of any part of the manure.

SAMPLING SUPERPHOSPHATE CONSIGNMENTS.

This invoice certificate is nothing more or less than a warrant. Recently, whilst loading his manure a farmer was incidentally made aware of the presence of the inspector and erroneously thought that as he had no invoice certificate he would get into trouble. It was most amusing to see him immediately drive away at a furious pace leaving behind, in the centre of the road, a bag of superphosphate.

Incidents of this description are not common, but it is unusual for farmers to willingly give information or produce invoice certificates. The sole object of the Manures Act inspection conducted by the Department is to protect the farmer and, accordingly, he should hail the visit of an inspecting officer with pleasure rather than hurriedly make an undignified exit.

Section 24 of the Act empowers the Deputy Chemist to demand the invoice certificate received with any artificial manure and, unless the inspecting officer be wilfully obstructed, the producer has nothing to fear and everything to gain. Every farmer who purchases artificial manure should not take delivery unless he has a warranty in the shape of an invoice certificate, and this should be carefully preserved.

A popular question of the farmer is :—" Whose superphosphate is the best?" It has often been related by wheat-growers that they have carried out experiments with different brands of superphosphate and that the result from one particular brand far eclipsed the rest. This fact, while not being contradicted, may not have been due to the superphosphate itself, but more likely to a difference in the soil and a multitude of other circumstances.

The idea, which is very prevalent amongst farmers, that different brands of superphosphate supply different plant foods to the soil, may be immediately dismissed. The manufacture of all superphosphates of ordinary standard has for its fundamental principle the solvent action of sulphuric acid on insoluble rock phosphates. The product may differ slightly in the percentage of fertilizing constituents, but the chemical compounds present are always the same. As far as quality from a chemical standpoint is concerned, the farmer may look to the laboratory for assistance; but for physical differences, *i.e.*, the behaviour of the manure in the drill, he must rely on his own judgment. It should be mentioned here that

UNLOADING ROCK PHOSPHATE AT YARRAVILLE.

drills should be thoroughly cleansed after use. Some manures are very acid and the longer they are left in contact with a drilling machine the shorter its life.

Another common query from northern farmers, who have the opportunity of observing large quantities of gypsum or copi being despatched to the metropolis, is "Why are manufacturers allowed to adulterate with gypsum?" They state, in some instances, that the gypsum, which occurs as deposits on or near their holdings, after being consigned to Melbourne and then treated with an acid, returns to them as superphosphate. This is altogether incorrect. Others say that the gypsum is mixed with superphosphate, which is afterwards purchased by them, and they contend that the "mixing business" can just as readily and cheaply be performed by themselves.

The gypsum despatched to Melbourne is largely sold as a texture improver for stiff soils, as a remedy in clover sickness, as a deodorizer in stables, and I have even heard of it being used in making a tennis court. It is certainly used as an admixture in most of the bone fertilizers, but rarely in other manures, although one manufacturer used it in the "Bone

and Super" sold by him this year. In the manufacture of superphosphate approximately 50 per cent. of gypsum is formed by the acid treatment and this is a constituent part of the finished product.

Still another fallacy existing among tillers of the soil is due to the manner in which manures are guaranteed on invoice certificates and labels. The analysis, as given on these documents, does not total 100 simply because the percentage or parts per hundred of fertilizing constituents only are given. Farmers are altogether wrong in assuming from this data that the rest is sand or other worthless matter. Take, for example, a superphosphate guaranteed on the invoice certificate and label to contain 17 per cent. water soluble phosphoric acid, 1 per cent. citrate soluble phosphoric acid and 2 per cent. citrate insoluble phosphoric acid, making a total of 20 per cent. phosphoric acid.

The complete analysis of this manure would be something akin to the following:—

Moisture.	Water Soluble *Phosphate.*	Citrate Soluble *Phosphate.*	Citrate Insoluble *Phosphate.*	Gypsum.	Impurities.
12 per cent.	28 per cent.	2 per cent.	4.5 per cent.	50 per cent.	3.5 per cent.

A bonedust stated on the tag and invoice certificate to contain 4 per cent. of nitrogen and 22 per cent. phosphoric acid would give a complete analysis as follows:—

Moisture.	Organic Matter.	Tri-Calcic Phosphate.	Other Mineral Matter.
10 per cent.	30 per cent. (containing 4 per cent. *Nitrogen*).	48 per cent. (containing 22 per cent. *Phosphoric Acid*)	12 per cent.

It will therefore readily be seen that the analysis of a manure as given on invoice certificate and label does not profess to be a guide as far as complete composition is concerned.

Farmers have at different times asked the mode of procedure when manure on delivery at the farm is suspected to be of low grade. The information is given under sections 11 and 13 of the Artificial Manures Act No. 1930 and is as follows:—

(1) Written notice (registered letter) must be given to the manufacturer, vendor, or agent within fourteen days of his (the farmer's) intention to have the manure sampled and analyzed.

(2) In such notice he shall offer to divide at any time within fourteen days in the presence of the manufacturer, dealer or agent a sufficient sample.

(3) The sample taken from not less than 10 per cent. of the parcel, and after being well mixed is divided into three separate parts and then and there each part placed in a dry glass bottle and properly marked and sealed. The bottles are to be signed by purchaser and agent or representative.

(4) One bottle is delivered to the manufacturer, vendor or agent, one is retained for future comparison, and the third is submitted to the Government Agricultural Chemist or an official analyst, either personally or by registered post.

(5) If the manufacturer, vendor or agent does not within ten days after service of the notice accept the offer of the purchaser, as above, the proceedings go on without him, but it is always preferable to obtain a police constable as a witness.

As there are many difficulties in the way of obtaining a fair and representative sample, it is always best to seek the advice of the Chemist for Agriculture as to the manner in which the sample should be taken.

Purchasers who happen to be taking delivery of manure from an agent at the time of inspection repeatedly ask if the result of the analysis will be forwarded to them. As a matter of fact, he is powerless, even if the manure should analyse low or prove to be adulterated.

The samples collected are all marked with a definite number and are afterwards published in the *Journal* under this number, so the farmer, by taking the number on the agent's duplicate bottle, will have no difficulty in finding out the quality of the manure purchased.

TOBACCO CULTURE.

T. A. J. Smith, Tobacco Expert.

(*Continued from page 54.*)

MANURES AND FERTILIZERS.

Another question often asked is, "Does tobacco exhaust the soil?" To this the reply is "No, not more so than potatoes." A crop of 1875 lbs. of cured leaf and stalk takes from the soil per acre the following quantities of the three main plant foods, viz., nitrogen, 65 lbs.; potash, 89 lbs.; phosphoric acid, 8 lbs. A 6-ton crop of potatoes takes, nitrogen, 58 lbs.; potash, 101 lbs., and phosphoric acid, 32 lbs. The average crop of cured leaf is 1,000 lbs per acre. Therefore, the average crop of tobacco takes only about half the potash, one-sixth of the phosphoric acid and slightly less nitrogen than a 6-ton crop of potatoes. As compared with a wheat crop of 30 bushels, the average crop of tobacco takes about the same amount of nitrogen, about four times as much potash, and only one-third as much phosphoric acid.

Our soils are generally fairly rich in nitrogen, rich in potash, but low in phosphoric acid; consequently, they are, as regards these three foods concerned, naturally suited to the growth of tobacco. But there are other influences to consider, as previously stated. Tobacco dislikes a sour soil, and is a fairly large lime feeder. Nearly all the tobacco so far grown in Victoria has been grown in soils somewhat deficient in lime; a great part of the North-Eastern District, where the rainfall is heavy, is inclined to be acid and is known by analysis to be short of lime.

The amount of lime required by tobacco as a food is about 50 lbs. per acre for an average crop, but the application of lime would have a beneficial effect in many other respects. An application of from 400 lbs. to 500 lbs. per acre would tend to release a large amount of the potash that we know to be in the soil; the soil temperature would be increased; an alkaline instead of an acid condition would be brought about in which nitrifying bacteria would develop and perform their duties at a greater rate, thus giving a larger quantity of nitrogen in the form of nitrates to the crop. Other beneficial results from the application of lime are the

more thorough decomposition of crude vegetable matter, and the improved mechanical condition of the soil.

Seeing that the tobacco crop is a quick feeder, taking all its nutriment from the land in from 12 to 20 weeks, it is of the greatest importance that the fertilizers applied to the soil should be in the most available form procurable. The fact that tobacco is grown in Victoria during the driest months makes this the more necessary, all these foods being taken by the plant in a soluble form. From the foregoing facts, lime is apparently one of the best kinds of fertilizers and mechanical agents to apply, where that particular element is known to be limited.

Potash is another highly important plant food, and, when applied, great care is necessary to insure the use of only that form of potash which will give good results. There are some that will do more harm than good for this particular product. Too much chlorine in the soil is detrimental to the growth of good tobacco leaf, in that an undue proportion of chlorine or salt in the cured leaf will destroy its satisfactory combustion or burning qualities. For this reason, we must be careful not to use potassic fertilizers containing an undue amount of chlorine, such as chloride or muriate of potash or kainit. The best forms to use are sulphate of potash or carbonate of potash from which only good effects can obtain. Potash, in large quantities, will to some extent counteract the effect of chlorine in the leaf; the larger the proportionate amount, as compared with the chlorine content, the better the burn.

In the use of phosphatic manures, bone meal appears to give the best results; this is probably due to this fertilizer being an organic manure in which free sulphuric acid is scarce, as compared with the mineral superphosphates. The effect of a superabundance of phosphoric acid in the soil is said to hasten maturity and in some cases cause rust or blight.

Nitrogenous manures, if in excess, increase the nicotine content in the leaf; and if used must be applied with caution. Tobacco leaf grown on Victorian soils unfertilized even now contains up to 6 per cent. of nicotine, which is too large a percentage. The best American tobaccoes contain from 1 to 4 per cent. of nicotine, the average being just under 2 per cent. Except in rare instances, it appears as though our soils would be better left unsupplied with nitrogen as a fertilizer at present, unless much poorer land is used than has been the case in the past.

Nitrate of soda, though a quickly available fertilizer, does not appear to be popular in America, probably owing to the danger of loss. It should, if used, be applied after the plants are out in the field, and never when the seed is sown as it is liable to loss by evaporation. The soda contained, if largely used, is detrimental. Nitrate of potash is good, if procurable, but it is seldom to be had at a price suited for this use.

Sulphate of ammonia should be applied when the land has received its last preparation before planting out. It contains a fairly large amount of sulphuric acid which, especially on soils deficient in lime, has a bad effect.

Red blood is a highly useful nitrogenous manure for tobacco and should be applied just before transplanting. It has a beneficial effect on the colour of the bright plug tobacco leaf. Black blood is not so good as red, being of slower availability.

Ordinary farm manures, if applied in too great a quantity, cause a growth of heavy coarse leaf with too great a nicotine content. Where a soil has to be manured, a judicious blend of farm manure and commercial fertilizers is best. The following formula is popular in the American

States, where, however, such manures as cottonseed meal, castor pomace, and cotton hull ash, not procurable at present in Victoria, are used in large quantities.

FORMULA FOR POOR SOIL. PER ACRE.

300 lbs. of Lime.	100 lbs. Bonedust.
200 lbs. of Sulphate of Potash.	½ cwt. Red Blood.

The lime should be applied in the autumn by dumping it down in 50-lb. or 100-lb. lots on the surface of the land which should be ploughed and then covered with a layer of soil a couple of inches thick. In eight or nine days it should have thoroughly slaked down and can then be spread over the land, either by hand or machine, and harrowed in. No other manure should be put on for at least six weeks after, and at the end of that time, or say eight weeks, farm manure can be worked in at the rate of from twenty to thirty loads per acre. Then, just previous to planting out, the potash, bone, and blood manure should be applied broadcast and harrowed in.

For old land and land that requires building up, the farm manure will be of great value; but where rich flats are used or the soil is naturally rich in humus, it is better not used. In dry districts, it should only be used in a well decomposed moist condition; if not well rotted, the effect will be to make the land too dry. The fact that tobacco takes only 12 to 20 weeks to mature necessitates a larger amount of plant food to draw upon than is actually required to develop the crop. The different elements of food are in some cases too slowly released for the plants to get their full benefit in the period of growth. Nothing, however, is wasted as the residual foods are still in the ground and available, either for the next crop or a catch crop grown through the winter.

ROTATIONS.

In order to keep up the supply of humus in the soil and restore the loss of nitrogen taken by the tobacco crop a rotation is necessary. As soon as the crop is harvested in the autumn a sowing of rye, peas, and vetches can be made, and, if early April rains fall, fine winter feed for fattening sheep, or for dairy cows, can be grown. A spring fallow can be given in August and the stubble ploughed in; the root matter and stubble will supply the humus. The nitrates will be held in the soil by the roots of the rye, and the peas will have supplied a quantity of nitrogen through the agency of the nitrifying bacteria on their roots, as also will the vetches. Being a deep rooting crop, rye too, has the power of releasing phosphoric acid which otherwise would not be available.

In some districts, the growth of Red Clover, or some of the Trefoils, will have equally good results. Where the land can be laid out for a year or two and Red Clover will thrive, a crop of this kind will do more to enrich the soil, than any other. It is known as the king of rotation crops, for the reason that it releases more plant food than any other, leaves a larger amount of decaying root matter in the soil, and is in itself a fine fodder crop. It is, however, a summer grower and for that reason will require a season for itself, if grown in rotation with tobacco. It is also wise to follow the clover with either maize, oats or wheat, before again planting tobacco, as the clover is liable to leave too much nitrogen for the growth of high class tobacco. The maize, wheat, or oats will reduce this, while not drawing too heavily on the potash supply. It is not wise to follow potatoes or any root crop with tobacco as all root crops are heavy potash feeders.

If the land is not spring fallowed a couple of months before transplanting, there is a danger of trouble from insect pests, such as cut-worms and caterpillars. Consequently, it is not wise to leave the fallowing too late; also time to rot the vegetable matter turned in is required. In any case it is inadvisable to plough under a heavy growth of greenstuff, as fermentation is likely to ensue and the land after it has rotted is liable to be left too open beneath the surface.

Transplanting.

When the plants in the bed have grown leaves from 2 to 3 inches long, they are ready to transplant. If the soil in the bed is stiff, and the roots break in drawing, the bed should be watered a short time before pulling commences. An old dinner fork, to loosen the soil close to the roots of the plant to be drawn, is useful. The plant should be taken by the leaves, being careful not to bruise the heart or stem, and drawn gently. As each one is taken from the bed it should be kept in the left hand, with the roots all one way, and the handful then placed in a basket or kerosene-tin bucket, with the leaves to the outside and the roots to the centre. The plants, when pulled, should not be left exposed to wind or sun; a kerosene tin will hold from 700 to 1,000 plants, according to their size. When sufficient have been drawn, they should be covered with a wet cloth or green grass, and kept in a cool place until they are planted. Plants should always be pulled the same day as they are to be put in the field.

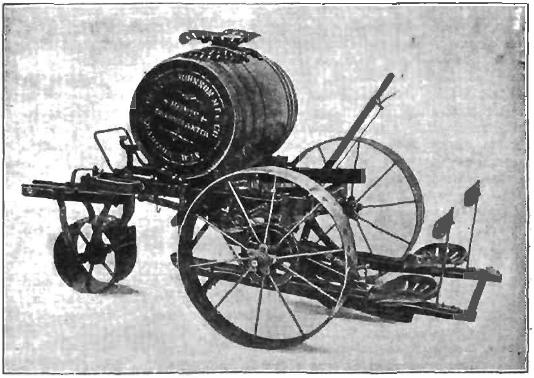
A cloudy day, with the soil in moist condition, is best for transplanting, and, if such conditions obtain, it is wise to get as many out as possible. If dry weather continues, plant out in the evening. The rows are better north and south, to allow the sun access to both sides during the day. The planter should take the plant in the left hand, and, with the leaves closed together at the top so as to cover the heart, then with the right hand, or a dibble, make a hole about 4 inches deep, pulling the hand or dibble towards him, the roots are inserted, care being taken to keep them straight, and the soil pressed close round, so as to keep the leaves still protecting the heart. The first rain will settle the soil and leave the heart clear. If the tap root is more than 4 inches long, it should be nipped off before planting. When the soil is dry, it will be necessary to water the plant when put out, and the simplest way to accomplish this is to put a barrel in a cart or sled, and draw the water to the plot, when buckets can be filled along the rows. A boy can then water the plant from these with a small tin fixed on a handle about 3 feet long. A pint of water to each plant is sufficient, and this should be gently administered round the plant, not over it. If the sun is very hot, each plant should be covered with a few straws or fern branches, which can be removed when the plant has become established.

Machines are used for transplanting in America in nearly all cases and are rapidly coming into use in Victoria, where they are now manufactured, at Wangaratta. They are an immense saving in time, and labour, and the work is done actually better than by hand. They are manipulated by one man and two boys, and drawn by either one or two horses; the driver sits on the water cask and the planters on the two seats at the back. The boy on the right hand seat gets the plant ready, while the boy on the left puts the plant, as he takes it from the other, root downwards in the trench made by the plough. An indicator, worked by a cam on the wheel, gives the signal to put the plant in and, at the same moment, a pint of water is liberated from the cask.

Two long plates of steel, which are curved in front and gradually run out to nothing on each side of the plough, break up the soil and close it up round the plant, leaving a dry surface over the water in which the plant is set. This is a great advantage over hand-setting as there is less loss of moisture and no caking of the soil round the young plant. A fertilizer can be distributed, if required, at the same time, but as already mentioned it is best to apply fertilizers beforehand.

The extra working of the soil at the last moment before planting has a good effect. Three hands can put out from 2 to 4 acres a day, and all the work is done sitting down, a circumstance that appeals to many.

The rows should be kept straight, if possible both ways, to allow for cultivation. Where hand-planting is done a line any length, with a piece of cloth 2 inches long, can be knotted in every 3 feet to mark the distances.



THE BEMIS TRANSPLANTER.

The cost of the machine is £16, and the life with care is easily 10 or 15 years. It is also useful for planting potatoes, maize, grass-roots, &c.

The system of deep planting has given best results in Victoria and more plants have been lost through shallow than too deep setting. The plant should be set so deeply that the outside leaves are kept by the soil in an upright position so that they protect the heart. These leaves will, later, drop off in any case and the heart of the plant will soon push its way upward.

It is possible in some localities to transplant too early. Tobacco that matures before the end of the summer is liable to miss the night dews, which have a most beneficial effect on the leaf during the ripening stage. On the other hand, if planted late, frosts may do some damage before the crop is harvested. In the North-Eastern District the best time to transplant is from the third week in October to the end of November. Plants

are often set right into January, but the risk from frost is great, and if the plant is cut before fully ripe, both quality and weight will be affected. It is always wise to put on all the hands available at the right time, and it will be found that the work can be more economically done with four or five hands than with two, where a field of 10 acres has to be set.

In a good season there will be a few misses, and these should be replaced as soon as it is ascertained that a plant has died. Plants with crooked stems should be avoided, also those with a bulb just about the root; also, if the heart has been injured, do not set unless short of plants.

The distance plants should be set depends on the soil, and the variety used. On rich flats, for heavy tobaccoes, 3 feet 6 inches each way is usual. For bright tobaccoes, on light soil, 3 feet each way; and for cigar, 3 feet to 3 feet 6 inches apart for the rows, and from 18 inches to 3 feet in the row.

As soon as the plants have made sufficient growth to enable them to be seen throughout the rows, the horse-hoe or scuffler should be run through to stir the soil and prevent weeds from coming. This treatment should be repeated three or four times, as the season demands, until the plants are too large to admit of their being worked between. The later workings should be shallow, to avoid injury to the roots.

In the early stages of growth the cut worm sometimes does considerable damage by eating through the stem of the plant just above the roots. If this pest is bad, it must be watched for and destroyed. A good poison for the purpose is made by steeping bran in molasses and arsenic, or Paris green, and spreading where the worm is bad. If the soil has been well worked through the winter, this worm will not do much damage. The tobacco caterpillar also does a great deal of harm in some seasons by eating holes in the leaves and heart, and should be killed whenever observed. They will often drop to the ground when being searched for, and in hot weather are generally found under the leaf.

To keep the plants growing, the soil close round the stem of the plant should be kept open with the hoe, especially soils that cake round the stem. Later on, when the plant has reached a foot in height, a little soil can be drawn up to the stem all round by a hoe, to support the plant in case of windstorms. The advantage of priming, that is, taking the bottom leaves off to the number of five or six, is doubtful; they are of little value in themselves, but serve in some cases to protect the leaves above them from becoming dirty by contact with the ground, and also in exceptionally dry seasons prevent the sun from scorching the soil close to the butt of the plant. If it is done in this climate at all, a light priming, say, three or four leaves, will be found enough. The field must be kept clear of weeds throughout.

Topping.

The flower bud should make its appearance about ten weeks after planting in the field, and should be taken out of all plants not intended for seed, directly it shows above the top of the plant. When topping, judgment is required as to the number of leaves to be left on the plant. On rich soils, such as are generally cultivated in Victoria, a greater number can be left on than is customary in America. Our leaf is, as a rule, too rank and coarse, with too large a mid-rib, and strong flavour. For this reason it is better to have more leaves of finer texture and quality, and it has been found that sixteen to eighteen leaves are not too many to mature properly where the soil is rich. If the plant is left to mature, it will

grow from 25 to 30 leaves, and it will be noticed that four of the bottom leaves and four to six of the top leaves are of inferior quality. Therefore, in topping, the inferior leaves should be removed with the bud from the upper portion, and not more than eighteen left on, exclusive of the four inferior bottom leaves. If the crop is late, and frost is feared, then it is better to top lower, and the plant will mature quicker. In extreme cases only four leaves are left on the plant, in order to secure them in time for a cure. Tobacco should all be brought as nearly as possible to the ripening stage about the same time. On poorer soils fewer leaves should be left on the plant, which otherwise might not have sufficient strength to mature properly. In pinching out the bud care must be taken not to injure the leaves left on the plant.

After topping nature asserts herself, and in the effort for reproduction the plant sends out suckers at the intersection of the leaf with the stem. These, if left, will produce seed, and they should be taken off, by breaking sideways close to the stem, before they are 3 inches long. This work will have to be done about three times between the time of topping and harvesting, and is absolutely essential, for if the plants are allowed to seed the leaf is never as good quality, and the weight also is much less.

(To be continued.)

RAPE.

J. M. B. Connor, Agricultural Superintendent.

The accompanying photograph, taken on the 29th November, represents a crop of 55 acres of rape averaging between 7 and 8 feet high growing on the farm of Mr. C. Henry, 5 miles south of Garfield, on the Koo-Wee-Rup swamp. This paddock was in a similar condition to that illustrated on the next page. The stumps were burned off, after a heavy rain, during the early part of March, 1910. Rape was sown broadcast over the ashes at the rate of 2 lbs. of seed per acre. When one takes into consideration the unprepared and rough condition of the seed-bed, together with the small quantity of seed sown, the results obtained are phenomenal. Of course, the method and time of burning off the stumps on peaty ground, like that under review, require serious consideration and can only be safely attempted after heavy rains. The top layer of soil is then saturated with moisture and the stumps burn out when reaching the damp soil; otherwise, if set alight when the ground is dry, the peaty soil and stumps embedded in the soil would burn for weeks and the after results would be serious. Precaution, in this respect, cannot be too strongly emphasized.

Mr. Henry informs me that, after commencing to harvest the crop, the district was unfortunately visited by a very severe storm accompanied by heavy hail, with the result that the rape was broken down and nearly all the seed shaken out of the pods. The quantity of seed harvested so far has, however, returned over one ton per acre and is being sold at 2½d. per lb. This gives a gross return of over £23 per acre, which must be considered satisfactory under the circumstances experienced, together with the difficulty of securing suitable labour.

Rape grows well and produces large quantities of succulent crops of first-class fodder over a large range of soils, during both winter and

summer months. It is rich in flesh-forming constituents as well as fatty matter and ewes and lambs do remarkably well on it. It is estimated that one acre under normal conditions will fatten about 10 to 15 lambs.

CONDITION OF LAND PRIOR TO BURNING OFF OF STUMPS.
Portion on left hand was burnt off previously.

In some of the cooler districts of Victoria, where it is sown both in autumn and spring, as many as 20 ewes and lambs per acre are turned off in a few months.

RAPE CROP, KOO-WEE-RUP SWAMP.
Height, 7 feet; yield, over 1 ton of seed per acre.

Farmers throughout Victoria are beginning to appreciate the value of rape as a rotation crop, and for green manuring purposes, by adding

humus to the soil. It may be sown from immediately after the first autumn rains until the end of September. In the summer time, it seems to do better in the cooler districts than in the northern areas, whereas it grows more luxuriantly in the warmer zones during the winter. If sown after the early autumn rains, it will give abundance of luscious feed during the winter months, and when sown about September it can be fed right into the summer.

On account of the smallness of the seed, the seed-bed requires to be worked to a fine tilth. It should be sown broadcast and then rolled or brush-harrowed, care being taken not to cover the seed too deeply or else it will not germinate. The variety known as Dwarf Essex appears to give the best results, and certainly commands a better price per lb. if grown for market, as Mr. Henry is doing with his crop. It is usual to sow the seed at the rate of 4 lbs. per acre. For the purpose of preventing stock from bloating, it is always advisable to mix 1 lb. of white mustard seed with that of the rape. Animals should never be turned into rape or any other quickly growing fodder, when they are empty and hungry, otherwise bloating will result. Its habit of growth bears some resemblance to the swede turnip, but it attains a much greater height. It is mostly grown for the purposes of feeding off by stock or fed as a soiling crop. The milk of cows fed on rape is apt to be slightly flavoured.

Green crops, such as rape and those of the leguminous family, are often grown for the special purpose of being incorporated with the soil whilst in their fresh state. The practical farmer who is situated so as to obtain a green crop of this kind will have little difficulty in determining which one is best adapted to local conditions. Upon strong clay country which has been fallowed, if worked sufficiently early, the rape crop can be eaten off with sheep and then ploughed in. This will not only furnish the succeeding wheat crop with useful food, but will tend to improve the texture of the heavy soil.

In addition to the fertilizing matter, rape possesses a marked physical influence. In a strong clay soil, warmth is given by the root system opening up the soil particles, whereas, in a light and friable soil, where the furrow is properly packed, firmness is imparted by the aid of the fibrous roots. Without a previous crop of rape or some leguminous plant many soils throughout Victoria are much too light to grow wheat successfully. This fact alone should be sufficient to demonstrate the value of rape growing in crop rotation and its restorative effect on the soil.

It is grown by many farmers as an excellent crop for cleaning land of weeds. If not eaten too bare, its broad foliage and habit of growth smother the weeds. When sown for the purpose of cleaning a paddock it should be drilled in 2 feet apart, at the rate of from 1 to 2 lbs. per acre, so that the land can be inter-tilled during the growing period.

Rape grows luxuriantly on good soils and responds quickly to liberal manuring. It should receive more attention than it does at present as a catch crop in the large wheat areas. Thousands of ewes and lambs could be profitably turned off these areas if the land were top-dressed with manure immediately after the harvesting of the crop and well worked into the soil with a scarifier or disc harrow, and about 2 lbs. of rape seed broadcasted per acre after the first downfall of rain. This would be the means of supplying an abundance of succulent feed for topping off lambs for the freezing works and at the same time go a long way towards improving the fertility of the country.

MALDON DAIRY HERD COMPETITION.

J. S. McFadzean, Dairy Supervisor.

The prize offered by the Maldon Agricultural and Pastoral Society for the best managed dairy herd brought forward only two competitors, viz., Messrs. James Duff and George Gregg; and their farms were inspected on the 7th and 8th November respectively for the purpose of awarding the prize.

Mr. Duff's farm contains 286 acres, fronting the Loddon; and a portion of it is rich flat land, which can be irrigated from that river by pumping. Altogether, there are 48 acres of the farm under crops, viz.:—Wheat, 15, and oats, 15, on the higher land; and lucerne, 6; potatoes, 1; maize, 8; and Johnson grass, 3, on the river flat. A 17 H.P. oil engine and 7-inch C.F. pump are used in irrigating the crops on the latter section.

There has been a good growing season here this winter and spring. The grass and weeds have almost outgrown the lucerne; but, as the provision for feeding the stock on the farm includes the making of silage, none of this luxuriant growth of either fodder will be wasted. The Johnson grass is grazed, and the cows seem very partial to it. A few tons of lucerne hay are still on hand from last season, indicating that there has been no scarcity of fodder here for some time past.

The silo is of the wood and iron overground or "tub" pattern; and is situated handy to the barn and milking shed. There is also a well built dairy; but the milking shed and separator room are capable of much improvement as regards situation and construction in order to facilitate the work done there.

The stock are made up of 30 cows in milk, 3 dry cows, 1 bull, 9 young heifers, and 5 calves. The milk is separated and the cream sent to the factory; the skim milk is used principally in pig-fattening, only a few heifer calves being raised each year. These are supposed to be from the best milking cows; but, as there is no system practised whereby these can be definitely determined, their quality is a matter of speculation.

The cows are mostly Jersey-Shorthorn and grade Jersey stock; and an Ayrshire bull of good class is now being used with these.

The other competing farm, Mr. Gregg's, is of 70 acres, subdivided into 12 paddocks, 27 acres being in oats. Six acres have been sown with cocksfoot and rye-grass for grazing, 1 acre is in lucerne, while 1¼ acres were in barley and are now being sown with maize. The soil on this farm is poor; and, consequently, cultivation and manuring greatly increase its productiveness. As yet, lucerne has not been successfully grown; that paddock having been sown twice in four years without getting a good stand.

A dam above the paddocks where the lucerne and maize are sown has a pipe laid from it to irrigate with; but the water storage is as yet limited, although there is scope for increased conservation, both at this dam and another higher up the gully. Besides the dams, and underground tank at the homestead, the farm has the advantage of the Maldon water service to insure it against scarcity in this respect.

The cattle are in very good condition, 10 of the 12 cows being in milk. They are principally grade Jersey stock, of good milking quality; but two Ayrshires are included with them, one being a very fine-bodied

cow and local prize winner. The Jersey bull is a well grown animal, of very fair quality; and the calves by him are of good promise. He is well looked after, having a well-grassed paddock with shelter shed provided for him. Mr. Gregg says there is a good demand for this bull's services by other cow-keepers in the neighbourhood; and from the stock seen throughout the district, the Jersey breed appears to be very popular.

The business of the farm is the supplying of fresh milk and cream to the residents of Maldon; any surplus milk being separated for butter-making.

The milking shed and dairy are well floored and tidily kept. The small barn, with chaff-house, is neatly arranged; the chaff-cutter being driven by horse-works.

There is no silo; the owner, up to the present, has depended on the early sowing of barley to provide his autumn greenstuff. The want of the silo at times necessitates the purchase of some additional food in order to sustain the milk yield. Some of this expenditure could well be saved by making silage of a portion of the oat crop.

Mr. Gregg has been a successful competitor in the dairy contests at the district shows. The necessity for the careful handling of cows engaged in these competitions was instanced recently. One of the cows on his farm had a 4.6 test, but when being taken to the local show grounds, objected to leaving the premises. She was only got to the grounds after some little trouble, with the result that her milk then showed only 2.2 per cent. of butter fat. Under the most favourable conditions, some cows will not demonstrate their full quality in strange surroundings; and any undue excitement, such as occurred in this case, is almost sure to have a reductive effect on the butter fat yield.

POINTS AWARDED.

	—	Possible Points.	Duff.	Gregg.
100	Stock—Quality	75	39	53
	Condition	25	22	22
100	Pasture—Subdivision	10	4	8
	Quality	12	8	5
	Cultivation and fodder	36	32	15
	Water	26	18	19
	Shelter	16	4	6
100	Buildings and utensils	62	40	51
	Fencing, gates, yards, roads	18	14	9
	Manure removal and disposal	6	2	5
	Farm book-keeping	14	3	6
			186	199

First—Mr. George Gregg. *Second—Mr. James Duff.*

Comparing these two herds and their management, it will be seen from the points gained that there is little to choose between them. Mr. Duff has a considerable advantage in the quality and situation of his land; and he has supplemented his natural advantages by providing a silo to conserve his surplus fodder. His want of consistency in stock breeding, however, places him at a great disadvantage in such a competition. Further, his farm is either very much understocked at present, or the want of better subdivision reduces its carrying capacity during other months of the year; at least, 7 acres of grazing land per cow appears to be light stocking, especially when in conjunction with silage feeding

Reverting to the absence of system in breeding as previously mentioned, Mr. Duff explained the recent introduction of Ayrshire blood into his stock, by saying that he wished to increase the size of his cattle.

At the same time, his cows and heifers are by no means undersized. In any case, if size was required, it would have been much better to revert to the Milking Shorthorn than to introduce a fresh breed in the Ayrshire: the bulk of the present stock being Shorthorn-Jersey, re-crossed with Jersey. First-cross or grade-bred stock at times turn out almost as satisfactory milkers as those bred pure: but the introduction of a third cross, such as this, is a mongrelizing and, almost inevitably, a retrograde step. Each cross on a pure breed lessens the power of the progeny of those pure-bred animals to reproduce their inherent qualities in their offspring; and the principal object to be gained by keeping the breed pure is thus set aside. Crossing the light and heavy breeds of dairy cattle will increase the size of the smaller stock, but usually at the expense of the profitable production of milk and butter. If a farmer prefers big dairy cattle for his particular purpose, he should keep a big-framed pure breed, such as the Milking Shorthorn or Holstein. By carefully culling the inferior producers, he will put together an even herd of heavy milkers in a much shorter time than the same end can be attained by crossing light and heavy breeds; for there will be more uniformity in their progeny. For the same reason, if heavy milk production alone is required, irrespective of size, the lighter dairy breeds, such as Jersey or Ayrshire, are all-sufficient.

A dairy farmer who endeavours to carry on without a definite system of stock-breeding is as a ship without a compass—the odds are very much against his reaching the desired end. There can be no certainty in his progress; and what his stock will be like any year no one can foretell. System means success.

COLAC DAIRY FARM COMPETITION.

Judges:—Messrs. W. Kerr, A. E. McCure, and J. S. McFadzean.

There were two competitors in each section:—Messrs. Thos. Dare and John Meredith, for those keeping less than 50 cows; and Messrs. Wm. McGarvie and J. P. Morrissey, for those keeping over that number. Three inspections were made of each farm, viz., on the 13th and 14th July, on the 4th and 5th October, and the 20th and 21st December; two farms being inspected each day.

The scale of points appended is that furnished us by your society; and from them you will see that in the class for those keeping over 50 cows Mr. McGarvie is first, and Mr. Morrissey second; and in the section for those keeping less than 50 cows, Mr. Meredith is first, and Mr. Dare second. Mr. Morrissey wins the special prizes for the best Ayrshire bull and the best Yorkshire boar in the whole competition, whilst Mr. Dare secures the special prize for the best Berkshire boar.

The conditions on the several farms varied considerably in every section, except that of the water supply. In this, all scored full points on the windmill and trough system.

The milking sheds are all well built and floored; but the neglect of limewashing in either the shed or dairy buildings resulted in a loss of points in those sections where this had been overlooked. The situation of the milking shed, drains, &c., as regards the dairy was not altogether beyond criticism on some of the farms. The pigstyes on each farm were well floored; those on Mr. Morrissey's farm were particularly well planned for both room and convenience.

Mr. Dare is the only competitor who consistently practises hand-feeding during those months when the pasture is at its worst; and, in consequence, his cows easily lead in the matter of production. Even he, however, has not yet taken on silage making; without which no system of dairy farm feeding can be considered complete. This owner has the largest area of land under cultivation. All the work of this farm is done by Mr. Dare and his family. As this means some six or seven pairs of hands to distribute the work amongst when necessary, the labour problem, which is a matter of great moment with many other dairymen in the busy season, does not present any drawbacks to dairying on this farm.

Less had been done in regard to improving the pasture by sowing grasses on Mr. McGarvie's farm than on the others; while Mr. Meredith's luxuriant paddocks of strawberry clover and rye grass were all that could be desired.

Mr. McGarvie holds steadily to Jersey bulls in breeding up his herd; and Mr. Meredith as consistently holds to the Shorthorn. Messrs. Morrissey and Dare use both Ayrshire and Shorthorn bulls indiscriminately with their cows, which does not tend towards evenness in either appearance or production.

Both Messrs. McGarvie and Dare are doing good work in keeping individual records and tests of their cows; and both have some very good butter-producers in their heads. Mr. McGarvie sends the most of his milk direct to Melbourne for retail distribution; and has a small refrigerating plant, which allows of his dairy produce being handled to its very best advantage.

On all the farms, the fencing, gates, and roads were well kept; and the appearance and condition of the homesteads reflected great credit on the respective owners. Mr. Morrissey's vegetable garden was kept in exceptional order, and is productive far beyond the requirements of the family and employés.

Section.	Possible Points.	Points Awarded.			
		Dare.	Meredith.	Morrissey.	McGarvie.
Class of different varieties of stock on farm	100	68	82	70	71
Farm buildings, gardens, yards, and situation and condition of same	70	46	46	46	56
Provision for handling dairy produce	50	25	30	9	43
Shelter for stock	25	9	23	19	22
Pasture, feeding, and water ..	100	78	68	73	58
System of recording returns ..	40	21	20	21	19
Disposal of farm manure ..	15	4	10	3	5
General appearance and condition of farm	100	59	70	54	50
Total	500	310	349	295	324

For the best managed dairy farm of 50 cows and under.

John Meredith ... 349 points, 1st. | Thos. Dare ... 310 points, 2nd.

For the best managed dairy farm of over 50 cows.

Wm. McGarvie ... 324 points, 1st. | J. P. Morrissey ... 295 points, 2nd.

Best Ayrshire bull, J. P. Morrissey.

Best Yorkshire boar, J. P. Morrissey. | *Best Berkshire boar*, Thos. Dare.

ALCOHOL FOR MOTIVE POWER.

E. S. Holmes, Assistant to Chief Inspector of Produce.

The greatly increasing use in Australia of motors for all kinds of work makes it imperatively necessary that, in view of a possible failure of supplies of liquid fuel from abroad, the manufacture on *a large scale* of a cheap and efficient substitute for the foreign article should be commenced without delay within our own borders.

If the manufacture of this substitute could, at one and the same time, provide employment to a large number of men, and use up material that at present goes largely to waste, it would not only add to the commercial resources and prosperity of the Commonwealth, but would lead to a much wider and varied use of motive power in all its industries.

It is in the use of *small* motors that the enormous increase has taken place within the last decade, principally in the cities and towns, but the day does not appear to be far distant when the agriculturist will depend to a very large extent on motor driven appliances for the general operations of his farm. The question of liquid fuel supply is therefore one that greatly concerns him, and the solution will be all the more satisfactory if he finds that he can himself provide the material not only for his own wants, but for those of the whole community.

Scientific men, both in Europe and America, have been directing their research to the production and effective use of alcohol as a liquid fuel; considerable success has attended their investigations, and it would seem that in alcohol we have the very thing that our circumstances require.

The motive power, other than electricity, in general use at the present day for motor driven machinery is gasolene—a by-product in the purification of petroleum which constitutes about 5 per cent., by volume, of the crude oil. Being as it is, only a by-product, its production is limited by the output of the petroleum industry, and as the demand for gasolene has increased to a much greater degree than the demand for petroleum, it has led to the price of gasolene being almost doubled within recent years. What is to take its place if prices continue to rise and the supply falls short of the demand is a question that will have to be seriously considered before long.

Both in Germany and America it has been proved that alcohol as a motive power, gallon for gallon, is little inferior to gasolene. It has many advantages over the latter; it stands higher compression without premature explosion; it is cleaner; the exhaust gases are not so objectionable as those from gasolene; its vapour is not so inflammable as that from gasolene, except where closely confined; and its production is practically unlimited, being as it is a product of fermentation of starchy or saccharine matter, mostly at the present time of a waste nature.

In Germany during a single year, the production of alcohol, from potatoes alone, reached a total of 80,000,000 gallons. Potatoes, however, are not the only material from which alcohol may be produced. In America, the waste of sugar factories, the surplus corn crops, and even saw-dust and the stalks of maize are used. It is estimated that in America, in the course of a year, 100,000,000 gallons could be produced from corn stalks alone. One reason for the encouragement of the manufacture of alcohol from farm products is that it would provide a

market for large quantities of material in years of heavy production, the manufactured article being capable of storage for any length of time. Gluts on the market would be avoided to a large extent by the use of surplus material, and, at the same time, power would be provided for agricultural work.

In the manufacture of alcohol there is no waste of plant food, for the spirit is obtained from starch or sugar, both of which are built up in the plant organism from water and carbon dioxide which is taken from the air. The nitrogen, phosphoric acid, potash, &c., of the original plant remain in the residue after distillation and as this residue is used as a cattle food or is applied to the land as manure, the valuable constituents for plant growth are to a large extent returned to the soil.

The process by which alcohol is produced from starchy materials depends on the facts :—

(1.) That starch may be converted into a sugar called *maltose* by the action of an enzyme named *diastase* found in malted barley.

(2.) That this sugar is not itself fermentable but is transformed into a directly fermentable sugar by an enzyme, present in the yeast that brings about fermentation of the sugar produced by its contained enzyme.

(3.) That the result of the action of the yeast on the fermentable sugar is that alcohol, a liquid of relatively low boiling point, is produced and can be recovered by distillation.

It has already been stated that in Germany 80,000,000 gallons of alcohol were produced from potatoes in the course of one year. In Victoria there are harvested annually many hundreds of tons of potatoes which, though not suitable for human consumption because they are badly affected with various diseases, are suitable material for the production of alcohol; no use, however, is made of them at present for the above purpose.

DISTILLATION.

There are many forms of distilling apparatus in use in Germany, but the usual type of continuously working column apparatus is the one generally employed. If the alcohol is to be used for special purposes it must undergo further rectification and purification to rid it of fusel oils and water. This is accomplished by means of fractional distillation in special forms of apparatus.

A description of the special ferments, the apparatus used, and the method of production, are to be found in Brachvogel's *Industrial Alcohol*. This book should be read by all who are interested in the manufacture of alcohol from farm products.

DENATURING.

For industrial use alcohol must be denatured, that is, made unfit for human consumption so that only a low rate of duty may be levied upon it. This denaturing also prevents it being used for those purposes for which a high rate of duty is imposed.

The agents generally used in America for denaturing alcohol are methyl alcohol (wood-naphtha) and benzine. In Germany, besides methyl alcohol, pyridine bases are used, while in England kerosene is employed in conjunction with the wood-naphtha. For special manufacturing processes where the ordinary denaturants are found to be objectionable, special denaturants are allowed by law, but the denaturing must be effective.

USES OF ALCOHOL.

The purposes for which denatured alcohol is already in use are numerous and varied, providing, as they do, a ready market for all that is at present produced. Its growing use in household cooking utensils, where gas and electricity are not readily available, is owing largely to its cleanliness combined with its heating power and simplicity of use. Alcohol has already been applied as fuel to stoves, kettles, water heaters, irons, lamps and numerous everyday household appliances. Although its flame is non-luminous, it may, by the aid of the Welsbach mantle, be used as a powerful illuminant. The heat produced by the burning of the alcohol vapour in combination with air is sufficient to raise the mantle to incandescence and in this way intense white light is produced. The demand for alcohol as a solvent in manufacturing substances, such as varnish, lacquer, enamel, &c., is too well known to need more than a passing reference.

The main use, however, of alcohol in the future will, without doubt, depend largely on its successful employment as a liquid fuel for industrial motors. Its wide utilization, in this respect, may be confidently expected, if we take into consideration the facts already stated that gasolene is rising in price and that it is limited in quantity; at the same time, the tendency of alcohol is to fall in price and its production is practically unlimited.

That alcohol can be used as an efficient motive power has been demonstrated, but the type of motor that will use the alcohol to the best advantage has still to be evolved. When this is done and alcohol falls somewhat in cost, as a consequence of its manufacture in large quantities by improved methods, it will no doubt be the leading liquid fuel of the future. Already, in Cuba, where alcohol is cheaply produced, many of the water pumping plants are run on alcohol. At Matanzas, a 45 horse-power pumping engine is running at a cost of about 16s. per day for alcohol. At Vento, in connection with the Habana water scheme, a 180 horse-power engine using alcohol has been installed, and is capable of pumping 1,000,000 gallons of water at a cost of 6s. 8d. From these examples it will be seen that alcohol fuel is not necessarily confined to use in small motors: in Germany, many hundreds of engines are running with alcohol, while in the United States this fuel is being widely used as a motive power.

With reference to the possibilities of production, it may be stated that, according to statistics given in Brachvogel's *Industrial Alcohol*, the United States produced in 1905 a quantity equal to 150,000,000 gallons of 50 per cent. alcohol while in Germany the output equalled 200,000,000 gallons of 50 per cent. strength. It must be remembered that the American standard taxable gallon is of 50 per cent. strength; although the alcohol as it comes from the stills is of various strengths, up to 93 per cent., it is all calculated on a common basis of 50 per cent. strength and production is recorded in taxable gallons. We cannot consider these figures without being struck with the fact that in alcohol a large market can be opened up for the surplus and waste products of the Australian farm.

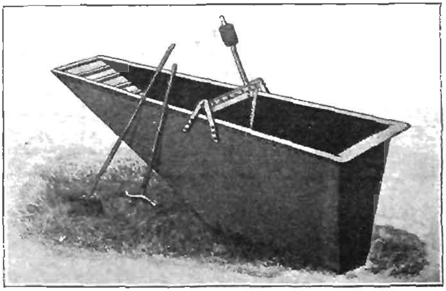
Agricultural countries older than Victoria are finding it profitable to utilize various farm products for alcohol production. It is time we made a step in the same direction and it is to be hoped that, in the near future, Australia will possess large and suitable distilleries for turning diseased potatoes, the refuse of sugar works, and other waste material, into a valuable commercial product.

DIPPING BATH AND YARDS FOR A SMALL FLOCK.

G. A. Sinclair, Principal, Longerenong Agricultural College.

Recent legislation has imposed on all farmers the duty of dipping their sheep; and, in consequence, there will be many dips erected within the next twelve months. Most of the plans in existence are for large flocks, providing a long swim bath, generally of brick, which is not suitable material for underground structures in many districts, as the movement of the soil soon shatters the walls.

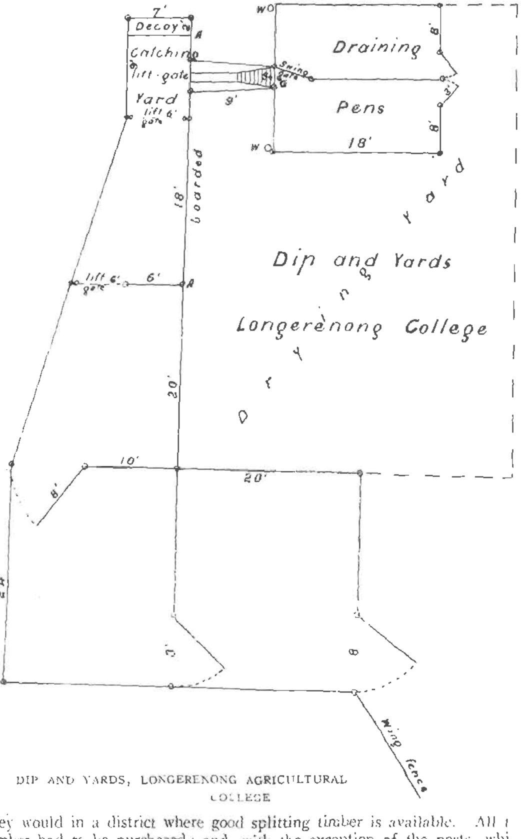
The plan adopted at this institution is for small flocks only, and about 800 sheep per day can be put through comfortably and thoroughly. We are indebted to a well known Tasmanian sheep breeder, Mr. F. Burbury, of Ashgrove, for the general idea of the yards, and the details worked out here may be useful to many at this juncture. Experience has shown that there are objections to the usual style of dipping yards with a long race often feeding upwards and thus entailing much handling and bruising of sheep, ending in a sudden drop into the dip, and a long climb out at the other end. These are well known to most farmers; and the aim in this plan was to avoid these drawbacks as much as possible.



DIPPING BATH FOR SMALL FLOCKS.
(Out of the ground.)

The galvanized iron dip used cost £7 15s. in Melbourne, and was built there by a local manufacturer. The whole of the work is on one general level. The floor of the draining pens has a fall of 1 inch from the centre to each side, where a drain catches the liquid dripping from the sheep and runs it into two wells (W.W.), each drain having a fall of 2 inches from back to front. The liquid is pumped from the wells back into the dip with a Californian pump made by a local plumber. The bottom of the pump is closed and perforated to keep out any dirt. When ordering the bath it would be advisable to stipulate for a curved pipe to be put in at the end near the top at S which should lead to a shallow opening at G, covered with a grating. If the drains are led to this, the liquid draining off the sheep will run back to the bath by gravitation. The pipe should be 3 inches in diameter.

In the catching yard and draining yards the soil was excavated to a depth of 15 inches. Sand was then put in to a height of 1 foot, and a floor of bricks in cement made on top. The yards cost more with us than



DIP AND YARDS, LONGERENONG AGRICULTURAL COLLEGE

they would in a district where good splitting timber is available. All t timber had to be purchased; and, with the exception of the posts, whi

were old railway sleepers, sawn timber was used. The fences are about 3 ft. 6 in. high, boarded with four 6 inch x 1 inch hardwood boards, six boards being used from A to A on plan, to prevent the sheep seeing the dip. The posts are about 6 feet apart, and 2 feet in the ground. A hurdle is placed across the front of the decoy pen, so that the sheep in it can be plainly seen by the flock. The draining pens will each hold about 40 crossbred sheep, and the yards and catching pens about 400 to 500 sheep. The price of the timber will vary so considerably with the district, that it is of little use to give the cost of the yards.

To protect the bath, and to obviate the necessity of removing it each year, we built a wooden framework around the outside, between it and the earth, both the bath and the framework being tarred. A check gate is provided with the bath, to prevent the sheep going through too quickly; but we found that many of them jumped well out and the bar of the gate caught them under the neck, so the check gate was removed. The sheep can easily be kept in the liquid by means of the crutch without injuring them. To prevent splash, a good plan is to put a 6 inch x 1 inch board along each side of the bath on its flat and projecting an inch or two over the bath. This can be fastened down to the sill under the rim of the bath, or to blocks driven into the ground.

DINGINESS IN WOOL.

In reply to a question forwarded by a correspondent from Dean's Marsh as to the cause of dinginess in wool, Mr. H. W. Ham, Sheep Expert, has furnished the following reply:—

In any climate, ill-bred, badly-thriving, dark-skinned, inferior-fleshed sheep are the most subject to secreting congealed or dead yolk. But rainfall has a most marked influence on sheep and wool, especially fine woolled breeds when meeting excessive and continued rains during late winter and spring while getting towards full wool. This condition is mostly found among merinoes, culled or rejected from flocks noted for cutting heavy weights per head, and in sheep with a strain of inferior Down's blood in them. It is rarely met with in Lincolns or Leicesters.

Good merino sheep that would be suitable for hot dry districts would be likely in an excessively wet one to show signs of congealed yolk. But sheep showing this unsatisfactory class of yolk through the whole length of the staple would be inferior in whatever climate they were bred in. Those showing it only on the skin in a wet district would not be in the least affected in a dry one.

Long-stapled sheep give best results in districts of heavy rainfall—they turn more water. Excessive rain does not directly cause healthy yolk to congeal, but through continued dampness being contained in the dense fleece an unhealthy state of the skin and flesh is brought about. It is generally thought that yolk, being a grease, deters rain, but it is not so. Water and yolk mix well together. Densely-woolled yolky sheep are not dried as much by the wind, as by evaporation of the heat of the body.

In a mild summer climate the ill effects of the sun on recently dipped sheep are hardly worth considering. In the northern districts open-fleeced, thin-backed, fine-wool sheep not possessing sufficient yolk will blister and a scurf will rise. It is only in hot and dusty climates that

the sun affects the wool left on at shearing. With machine-shorn sheep the extreme heat affects the roots of the fibres.

Where the sheep show too open and thin on the hips and shoulders dispose of them in the most profitable way. Breed only from those with characteristics suitable to the prevailing conditions of the district. Discard for breeding purposes those that have inferior wool. Wool possessing an excessive amount of dry yolk or, in fact, any inferior fleece, should be termed "Fleece" or "D Fleece." The word "Dingy" should not be marked on the bales.

FRUIT PRESERVING.

Miss A. Mendoza, Fruit Preserving Expert.

Considering that bottled fruit is such a favourite and convenient commodity, the process of preserving so simple, and the material usually obtainable at such a reasonable cost, it is a matter of surprise that more attention is not given to the subject. As the lack of information may probably be the cause the following hints are published.

JARS.—There are numerous makes of jars on the market; ten are shown in the illustration on the opposite page.

1. The "Mason" is of Victorian manufacture, and is made in three sizes—pint, quart, and half-gallon. It is fitted with a metal screw top, and is extensively used.
2. The "Spotswood," a Victorian jar, is made in two sizes only—quart and half-gallon. Like the "Mason," it has a metal lid, but differs from it inasmuch as it has a far wider mouth and consequently is better adapted for large fruits.
3. The "Lightning," also of Victorian make, is sold in three sizes—pint, quart, and half-gallon. It has a glass lid held in position with a wire fastening.
4. This is similar in make to No. 3, and is also known as the "Lightning," but is an imported jar.
5. Different shapes of the old English fruit bottle, which, on account of its narrow neck, is suitable only for small fruits. It is closed with an ordinary cork.
6. The "Canton," an American jar, is made in three sizes—pint, quart, and half-gallon—and has a glass lid with wire fastening. This jar is made of white glass, and, on account of its appearance, is largely used for show purposes.
7. This is another "Mason." It is similar in size, shape, and make, to No. 1, but is an imported article.
8. The "Improved Mason" is made in two sizes only—quart and half-gallon. The lid is of glass fastened with a loose metal screw. Imported.
9. This has a wide mouth suitable for large fruits, but is not on the Victorian market.
10. The "Atlas" is an imported jar, made in three sizes—pint, quart, and half-gallon. It has a wide mouth and screw top, and is well adapted for large fruits.

While, on the whole, each kind of jar mentioned gives good results, in all mak[illegible] with. When purchasing, the

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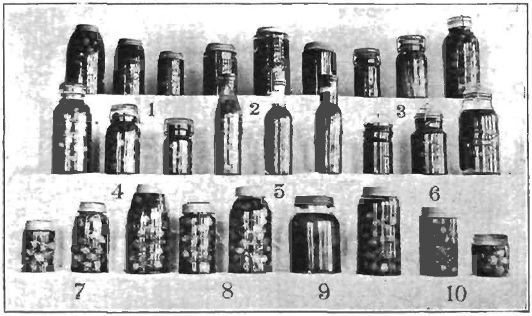
operator should see that the jars have a smooth shoulder on which the rubber rests. Should there be the slightest hollow or unevenness sufficient to prevent the rubber from lying close, and allowing the least air to get in, disappointment must result, as fermentation will set in and the contents lost.

RUBBERS.—Rubbers are an important item. Generally speaking, an inferior article is supplied with the jar. It is found more satisfactory, especially as the cost is not large, to get a better quality ring; further, unless they are of exceptional quality, it is undesirable to use them a second season.

FRUITS.—Any and every kind of fruit or vegetable may be preserved by the methods to be described, but to insure a satisfactory product it is necessary to have only good fruit to treat, for any flaw or blemish in the fresh article will show as distinctly in the preserved.



VARIOUS MAKES OF JARS—SEE OPPOSITE PAGE.

All fruits, with the exception of gooseberries, should be ripe so that they will be fully flavoured, but yet firm enough to retain their shape and form while cooking. If soft, they have a tendency to go more or less to pulp, according to the stage of ripeness, and of course are less presentable when placed upon the table.

PREPARATION.—*Gooseberries*, both ripe and green, are used for preserving; the former for culinary purposes and the latter for either that or for dessert. They require no other preparation than stemming and topping.

Cherries and *Plums* are simply stemmed; of the former, the firmer-fleshed varieties similar to "Florence" and "St. Margaret's" are favoured. The more juicy kinds are not considered so desirable. Practically all varieties of plums may be used.

Apricots, *Peaches*, and *Nectarines*, are cut in halves and the pit or stone removed; only the firmer kinds are used. In apricots, the "Moorpark" or similar sorts; and, in peaches, the later and yellow-fleshed varieties are favoured. It is desirable to first peel the rougher-skinned peaches; this is easily accomplished by placing the fruit in a muslin cloth, then dipping it for a few seconds into boiling water, to which may be added a very little soda, then plunging it in cold water. The skin should then be easily rubbed off.

Pears and *Quinces*, after peeling, should be cut in halves or quarters according to size, and the core removed.

Pine Apples are usually pared and sliced, though sometimes cut into small squares.

Rhubarb is prepared in the ordinary manner and may be preserved in pieces the length of the jar or cut into short lengths.

Tomatoes are bottled, either with the skin on or peeled. Instead of being preserved in syrup, the jars are filled with water to which a little salt has been previously added.

Currants require no other preparation than stemming.

PRESERVING VESSEL.—Any kind of cooking vessel will do for this work, provided it is deep enough to take the fruit jars. An ordinary washing boiler answers the purpose admirably; but it is necessary that a wooden shelf or false bottom of about a couple of inches less in diameter than the vessel used, and standing on feet of, say, 3 or 4 inches in height, should be placed in the bottom of the boiler so that the jars will have a level resting place and be kept above the water.

COLLECTION OF PRESERVED FRUIT.

METHOD OF PRESERVING.—There are several ways of accomplishing this work, but the one usually adopted is to first make a syrup consisting of half a pound of sugar to each pint of water. The fruit is prepared and placed while raw into the jars; if carefully packed, the jars and contents will have a much better appearance than if put in at random. Then fill the jars with cool syrup and place them in the boiler close together though not touching. Put the lids either beside the jars, or loosely on them, as it is necessary that they also should be sterilized. Sufficient water having first been poured into the boiler, reaching to the false bottom, the boiler must then be securely covered to retain the steam, and the contents brought slowly to the boil and kept at that temperature for a sufficient length of time to cook the fruits.

The advantage of putting only sufficient water into the boiler to reach the shelf, or false bottom, and cooking the contents by the steam generated, is that a second lot of jars may be placed in as soon as the first is removed, thereby economizing time and labour.

No hard and fast rule can be laid down regarding the length of time necessary, as so much depends on the kind and size. But, as a guide, it may be said that in the case of small fruits, such as gooseberries, currants, &c., 4 or 5 minutes at boiling temperature should suffice. Apricots, peaches, and nectarines may require from 10 to 15 minutes; while pears and quinces could do with more, though in no case should the fruit be allowed to boil to pulp as it is very desirable that when placed on the table it should retain its proper shape.

When sufficiently cooked, the jars are removed from the vessel, and additional syrup, which should be kept boiling for the purpose, is poured on to the fruit till it overflows the bottle so as to exclude all air bubbles. The rubber ring is then placed on the jar and the lid speedily fastened down while the contents are still at boiling heat, or very near it. Whilst it is desirable, as previously stated, that the fruit be brought to boiling point slowly so that the heat may penetrate well through it, in order to kill all ferment germs, it is necessary, when closing the jar, that no portion of the contents should be below 180° F., or the process will probably be a failure.

Another method of preserving is to sterilize the fruit in an open vessel just as if it were required for table use, excepting that it should be rather under-cooked. Then lift from the vessel with a perforated ladle so as to separate it from the liquid in which it was sterilized, which may be either syrup or water, and place in the jars in which it is to be preserved. The latter should be stood in hot water to avoid breakage when the boiling water or syrup is poured on, and the bottle filled and closed similarly to that described above. This method of preserving is one that is usually adopted for household use where appearance is not of so much consequence, and it is equally as effective as any other.

When an ordinary bottle is utilized for small fruits, such as cherries, gooseberries, or currants, the cork used should be fairly deep, and fit as tightly as possible. To insure success, it is advisable to have a little melted paraffin at hand and, immediately after corking, to dip the top of the bottle into the paraffin. When cool, this will stop all air passages in the cork.

Fruit intended to be again cooked before use, may, if desired, be preserved in water and the necessary sugar added at the second cooking.

Fruit preserved in either of the methods described, provided the directions are strictly adhered to, and the jar hermetically sealed, should as long as it remains air-tight, keep for an indefinite period. It must be distinctly understood that the fruit is preserved by sterilization, and that the sugar is used only to make the article more palatable and not as a preservative. The strength of the syrup mentioned will be found suitable for most fruits, but for very acid ones, a little more sugar may be added; or, if excessively sweet fruit is being treated, a weaker syrup may be used.

CANNING.—Cans, with stud lids, varying in size from 2 lbs. upwards, are used for this purpose. The fruit while raw is carefully packed so that the can shall hold as much as possible; the latter is then filled with the syrup previously prepared and of a strength similar to that used for bottling. The cap or lid, having a vent hole in the centre, is placed in position and soldered down, and the cans then put into the cooking vessel

and a similar process followed as when using glass jars. When the contents are cooked, the tins are taken out, the vent soldered up as speedily as possible, and immediately re-placed in the boiler, and kept there for, say, 4 or 5 minutes, after which they are removed and cooled.

If not properly sterilized, or should there be any leakage, fermentation will set in and in a little while cause the tin to swell or bulge out. Should this be the case, the fruit will of course not keep, but if air-tight, and the process properly carried out, the top and bottom of the can should show a slight hollow rather than a swelling and the fruit will keep indefinitely.

Pulping.—Pulping is frequently resorted to when, for any reason, it is not convenient to immediately make the fruit into jam. The process is simple, and is accomplished by placing the fruit when prepared into an open vessel with a little water sufficient to keep it from burning. Bring slowly to the boil, and, when cooked sufficiently, pour into large tins or

FRUIT PRESERVING ROOM AT TECHNICAL EXHIBITION.

cans and immediately solder down. It may be left in the cans for any length of time till needed for use, and the sugar added when made into jam. Kerosene tins, when properly cleansed, are frequently used for holding the pulp; they are a cheap package and answer the purpose very well.

When preserving in tins, either as canning or pulping, care should be taken to examine the tins for a few days after the operation is completed. If it is found that there is no depression in the top or sides, it is a true indication that there is a leakage of air; in a short time fermentation will set in and instead of a depression there will be a bulge. In such case it is necessary to puncture a small hole to allow the gas to escape and to re-sterilize the tins and again solder down as before.

Before using the tins, it is well to find out whether there is a leakage in the tins caused by defective soldering. This is done by pressing the tins, with the mouth downwards, into hot water; should any leakage occur the air will escape through the leakage and it may be easily detected. This

method is adopted in various factories, and would, if practised, frequently avoid disappointment; it is often difficult to detect where the leakage takes place when the soldering is defective.

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With the object of imparting information on this and kindred subjects, demonstrations are given at the Technical Exhibition, 581 Flinders-street, Melbourne. No charge is made, and visitors are welcome at any time in office hours.

INTRODUCING QUEEN BEES.

F. R. Beuhne, Bee Expert.

The beginner in bee-keeping and, sometimes, even the more experienced apiarist, has difficulty in introducing a new queen to a colony of bees; occasionally, absolute failure is the result.

A considerable percentage of the queens bought annually from queen breeders are lost in introduction. This is chiefly owing to the bee-keeper failing to observe the many changes in the mood or temper of bees, due to climatic influences, variation of nectar secretion, and the methods of manipulation of modern bee-keeping.

When the colonies of an apiary are in normal condition, the printed instructions usually sent out with queen bees will insure safe introduction; under certain conditions, which will be referred to further on, the usual method must, however, be entirely departed from. To introduce a new queen to a colony it is, first of all, necessary to find and remove the queen which is to be replaced. It is during this operation that, in most instances, the foundation for future trouble is laid. When the queen to be removed is a black or brown one, it often takes considerable time to find her. Bees from other hives are attracted and the bees of the colony operated on are roused to a state of attacking any stranger; and, when the new queen appears amongst them a day or two later she may be killed right away or balled and worried to death.

The hunting up of queens should be done towards evening when bees have ceased to fly; care should be also taken that no honey is spilt from combs so as to attract robber bees or ants next day. Bees will most readily accept a new queen after being queenless for from 24 to 48 hours. If queenless longer, queen-cells will have been started and the bees will be less friendly disposed towards a new queen.

When a queen is received by post, remove the cover of the cage and note her condition. If satisfactory remove the cork or covering slip from the end of the cage containing the candy and, if there is a queenless colony ready for introducing, place the cage wire downwards on top of the brood-frames. The bees, by gnawing out the candy, will release the queen in from one to three days. If no colony is queenless at the time of arrival, loosely replace the cover on the cage and keep it indoors. If, on examining the cage on receipt from the Post Office, the queen is found dead, notify the sender and as proof return the cage with bees and dead queen. You will then receive another queen—all reputable queen-breeders guarantee safe arrival.

By the method of introduction described above, the worker bees which accompanied the queen are introduced along with her. If the candy in the

cage is eaten out quickly and the queen released very soon, this escort of worker bees may cause trouble. Should the colony be in a perturbed condition, they are by their odour recognised as strangers and the animosity aroused is often transferred to the queen.

To avoid this contingency, the writer introduces queens by means of the cage described on pages 566-568 of the September, 1910, issue of the *Journal*. The queen is put into the cage alone (without workers). With the slides *b* and *c* in position, the cage is suspended between the brood frames of the colony where the hive odour is strongest; and when the queen is liberated by the consumption of the candy in the lower end of the cage, there are no workers of her own escort present to cause trouble and she has already the hive odour of the colony. The worker bees may be kept in the mail cage till it is known that the queen is safely introduced. Should, on the first examination after introducing, the queen be found balled, the ball of bees should be dispersed by blowing cool smoke on it, the queen secured and returned to the cage. Queen-cells which may have been started should be destroyed, by picking out the larvæ in them before the queen is again given to the colony.

Under very adverse circumstances, such as a dearth of nectar in the flora, robber bees in the apiary, or after wet extracted combs have been returned to the hives when nectar is not coming in freely, the methods of introduction usually employed often fail. If a queen *must* be introduced, it is best, before attempting it, to remove all combs containing brood, except one which is left till evening to prevent the bees leaving and joining neighbouring hives. At dusk, shake the bees off this comb, give it to some other colony to take care of, and hang the caged queen between the broodless combs. When the brood is removed, the bees should be shaken off and the combs put on other colonies till after the new queen is safely laying, when they may be returned, again without bees.

Success in introducing queens is assured largely by a minimum of interference and fussing. Most of the failures are due to two causes; either the colony has been kept open too long when hunting for the old queen, or it has been opened and examined too soon and at the wrong time after introducing the new queen. Over-anxiety of the bee-keeper for her safety often proves fatal to the queen. Under unfavourable conditions, bees will sometimes ball their own queens when the hive is opened; therefore a hive, which has just had a new queen given to it, should not be interfered with for at least two or three days, unless an unusual commotion at the entrance indicates that the queen is balled. If desirous of ascertaining whether the queen has been accepted, do so on the third or fourth day after the bees have ceased flying for the day.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, Principal, School of Horticulture, Burnley.

The Orchard.

Spraying.

A final spraying for Codlin Moth will be necessary this month. Probably owing to the irregular season, the moth has been more active during this season than last. Larvæ were observed entering the apple on the 4th

January; these probably belong to the second brood, and, if such, it is remarkably early, as previous records show the second brood to be operative about the middle of January. The fallen apples should all be collected and boiled, and all crevices and hiding places searched for larvæ.

The season has been favourable for the development of Bryobia mite and Woolly Aphis; and, as soon as the fruit has been picked from the trees attacked by these insects, a good spraying of strong tobacco water should be given. This will minimize to a great extent the winter work.

Fumigation.

Evergreen trees, including those of the citrus family that are infested with scale, should now be sprayed or fumigated to rid the trees of this pest. For spraying, a weak red oil emulsion, lime, sulphur, and salt spray, or resin wash will be found useful for the purpose. The most successful method, however, of dealing with the scale pest is by fumigation. The trees should be closely enveloped in an air-tight sheet or tent, and hydrocyanic gas should be generated inside. The chemicals for generating the gas, as well as the fumes of the gas itself, are excessively dangerous, and great care should be exercised in their manipulation. A wooden, enamel, or earthenware vessel is placed inside the tent, the vessel containing a mixture of 4 fluid ounces of sulphuric acid and 12 fluid ounces of water, the acid being placed in the vessel first. Four ounces of cyanide of potassium should then be quickly dropped into the vessel and the tent closed down at once; the bottom of the tent all around should be covered with soil to prevent any of the gas escaping. The operator must take care that not the slightest portion of the fumes is breathed. Fumigation should be carried out at night-time or on a cloudy day, and the foliage of the trees must be thoroughly dry.

General Work.

Citrus, persimmon, loquat, and guava trees will be benefited by a good watering at this time of the year.

Budding should be continued and the buds left dormant until the spring-time; to allow the buds to push their way out and make a weak autumn growth does not generally result in strong vigorous trees.

The soil surface should be still kept very loose, and frequent cultivation will greatly benefit the trees.

Fruit picking and packing will now be the principal work in the orchard; extra care should be observed in packing, particularly if the fruit is to be exported. The fruit should not be bruised or crushed, as either condition will cause rapid decay; it should not be packed moist as this also produces decomposition. Another point to be studied is the grading of fruit; for export, fruit must be graded. Graded fruit for the local market always brings more satisfactory prices.

New Fruits.

Several new apples are attracting the attention of English fruit-growers at the present time.

"Crimson Bramley" is a seedling from the well known Bramley's Seedling. The fruit is medium size, of good flavour, and the surface develops a brilliant crimson.

"St. Everard" is a new dessert apple which received a first class certificate from the Royal Horticultural Society, and is the result of a

cross between Cox's Orange Pippin and Margil; it is an early variety, ruddy crimson in colour, with a flesh rosy-yellow, juicy and sweet—more like Cox's Orange Pippin than its other parent. It ripens early and is reputed to be a prolific bearer. The English *Journal of Horticulture* says that it is one of the finest and most aromatic fruits now in existence.

"Rev. W. Wilks" is a new culinary apple, the result of a cross between Peasgood's Nonsuch and Ribston Pippin; the flesh is white, juicy, and pleasantly flavoured, the fruit itself being lemon-coloured suffused with red streaks on the sunny side. It is a large cooking variety, and is said to be a heavy bearer. This apple has also received a first class certificate from the Royal Horticultural Society.

Vegetable Garden.

Liberal applications of water, a plentiful mulching of stable manure, and frequent cultivation of the surface will be necessary during this month.

Young celery plants may be planted out in the trenches, and plants that have been previously growing should be blanched by earthing, or by any means that will exclude the light.

Continue to plant out cabbage, cauliflower, celery, lettuce, and other plants from the seed-beds.

Seeds of cabbage, turnip, lettuce, peas, French beans, parsnip, beet, and leek may be sown.

As soon as any block becomes vacant, it should be well manured and dug to prepare it for the next crop.

Flower Garden.

Constant watering and hoeing will now be required to keep the flower gardens in a condition of success. Cannas will require manuring, and the old flowering stem should be removed as soon as the flowers have passed their prime, to make way for new growth. Dahlias and chrysanthemums will need a great deal of attention, staking the growths as they develop, disbudding, thinning out weak shoots, and removing unnecessary growths. The dahlias should receive a good soaking with water during the hot weather, and liquid manure or quick-acting fertilizers should be given when the flower buds are developing. When chrysanthemum buds are very small, liquid manure should be applied.

Roses may now be summer pruned; all weak growths should be removed and the strong ones shortened to a fairly good bud. The plants should then receive occasional waterings with liquid manure, and be kept well supplied with water.

All flowering trees and shrubs that have finished blooming should be pruned; the flowering growths removed, and, unless the seed is required, all seed-heads should be cut off.

Cuttings of pelargoniums, zonale and regal, may now be planted delphinium spikes that have finished flowering should be cut down to make way for new growths, the plant being watered and manured.

Seeds of perennial and hardy annual plants may now be sown; and a few bulbs for early flowering may be planted. The beds should be well manured and deeply worked in anticipation of planting the main crop of bulbs.

PURE YEASTS OR "LEVURES."

F. de Castella, Government Viticulturist.

Nearly forty years have elapsed since Pasteur's remarkable investigation of alcoholic fermentation—the transformation of sugar into alcohol, which is brought about through the agency of certain micro-organisms known to science as saccharomyces and more generally as alcoholic ferments or yeasts.* He showed that most of the diseases of wine and beer are caused by bacteria. He also showed that several distinct varieties or races of yeasts exist, some of which act in a more satisfactory manner than others. In order to improve fermentation, two logical courses were open—

1. To protect the yeast from the competition of injurious bacteria.
2. To employ a variety of yeast capable of insuring a maximum of quality in the resulting product.

The second of these brings us to the subject of the present article.

Pasteur's discoveries and the research work conducted by his successors have revolutionized the art of brewing to such an extent, that a properly equipped bacteriological laboratory is now to be found in every up-to-date brewery, and that the use of pure yeasts has become more and more general in them. This is in marked contrast to what has, until quite recently, obtained in the closely allied sister fermentation industry of wine-making, in which spontaneous fermentation has been the almost invariable rule.

It is true that similar methods to those which proved of such value to the brewer were attempted many years ago. The results, however, were inconclusive and not up to expectations; and in this we have the explanation of the slow spread of the use of cultivated yeasts in the wine cellar. Reasons for this contrast are not far to seek. The spontaneous nature of grape juice fermentation renders the use of yeast unnecessary, and for many centuries wines of the very highest quality have resulted from the development of the ferment provided by Nature in the shape of the bloom on the outside of the berry. In the case of beer, yeast of some kind must be added, and it is easy to understand the difference in the results to be obtained from the development of a good, as opposed to that of a bad yeast, and the opportunity for improvement in the yeasts used.

Another radical difference between wine and beer must also be remembered. In the case of the latter, the yeast is added to a medium, sterilized by heat, so that it has every opportunity of developing without interference from organisms previously existing in it. With grape juice, preliminary sterilization is of difficult application and the added yeast finds itself face to face with all the germs naturally present in the bloom of the grape. Some, at least, of these have a very good chance of finding in the juice a medium more suitable for their development, than for that of the added yeast.

Hence, it very frequently has happened that the added yeast has played little or no part in the fermentation it was intended that it should bring about. The case is exactly similar to that of a cereal crop sown in a very dirty paddock, in which but little of the seed which was sown may live to yield any grain at harvest time. It is true that the addition of the cultivated yeast in a state of active growth should give it an

* The French word *levure* being the exact equivalent of the English "yeast," there seems no need for the retention of the former in the Australian viticultural vocabulary.

advantage over the natural yeasts which find their way into the juice in the spore state. More reliance has been placed on this point than was justified.

In this connexion the use of sulphurous acid (see article on Sulphiting in January *Journal*) constitutes a very considerable advance. Its antiseptic action on the spontaneous organisms prevents their development, whilst it does not hinder that of the added yeast, previously accustomed, in a separate culture, to life in its presence. Sulphiting has thus very powerfully contributed to the

Increase in the Use of Pure Yeasts in France.

That this is becoming more and more general is amply proved by the increased attention the subject receives in French viticultural literature. Even the advertisements show the increasing interest which is now being taken in the question in France where numerous institutions now devote themselves to the propagation and sale of pure cultures of selected varieties of yeast. There is also a decided tendency for the trader to pay a higher price for "Levured" wines. The extension of sulphiting and the better understanding of the laws governing the development of yeast are responsible for this marked increase. The object of the present article is to give some idea of the position the pure yeast question now occupies in France, to sum up as briefly as possible the leading opinions held on the subject, and to endeavour to explain some of the difficulties yet to be faced in connexion with it, and which have been responsible for its slow spread.

Though progress has been slow it is none the less sure. Professor Astruc describes how numerous comparative tastings have proved wines made with the aid of selected yeasts to be generally superior to those made in the ordinary way. One of the causes responsible for its slow adoption is that too much was expected from the new method at first. It was thought that it was only necessary to ferment a common must with a yeast derived from a celebrated vineyard in order to obtain a product resembling closely the wine from which the ferment was derived. The bouquet was at first thought to be largely due to the yeast, but it has proved itself to be a very elusive quality and little permanent result has been obtained in this direction. Disappointment of these first extravagant expectations led to the neglect from which the method has only recently recovered.

Reasonable Expectations.

It is now abundantly proved that decided advantages are to be gained from the use of cultivated yeasts, especially in the following directions:—

Increase in Alcoholic Strength.—This may amount to 1 or even 2 per cent. proof. It is due to two causes, viz., the use of a yeast of higher fermental power; in other words, one which can transform a larger quantity of sugar for the production of a smaller weight of yeast substance, and to the elimination of organisms which transform the sugar into other substances than alcohol—what M. Astruc terms sugar eaters (*Mangeurs de Sucre*), as opposed to ferments in the strict sense of the word.*

Improved Condition.—Wines fermented with pure yeasts, as a rule, clear themselves more rapidly than those resulting from spontaneous fermentation. Marked differences are to be observed in the behaviour of different varieties of yeast after the close of fermentation. Some possess the property of uniting together into small masses, thus bringing about

* The maximum production of alcohol possible would entail the transformation of 16.4 grammes of sugar per degree of alcohol (absolute by volume) and per litre.

their rapid and complete separation in the shape of a curdy sediment, the supernatant wine being left clear and limpid. In the case of others, the yeast cells do not so unite, but remain long in suspension, causing the wine to be cloudy or even milky for a lengthy period, ultimately forming a slimy and troublesome deposit.

It is, in fact, this self-curdling power of certain champagne yeasts which first led to the extensive use of cultivated yeasts in practical wine-making. The convenience of such easily eliminated sediment is peculiarly suited to the champagne system of handling wines, since it greatly facilitates the dégorgement process.* The second or bottle fermentation, responsible for the effervescence of sparkling wines, is now-a-days always started by means of pure cultures of yeasts which possess this property in a high degree. The advantages of rapid clarification apply with almost equal force in the case of non-sparkling wines. Most of the cultivated yeasts supplied by the trade are selected with a view to this valuable quality.

Resistance to Certain Adverse Conditions.—Many varieties of yeasts possess marked powers in certain definite directions. Some can resist higher temperatures than others, without suffering injury. Some can continue to transform the sugar in spite of the presence of a high proportion of alcohol in the fermenting liquid; in other words, they are capable of carrying attenuation further. Resistance in other directions, such as to high acidity, to a large proportion of tannin, &c., are possessed by certain varieties, each of which may prove of great value under given conditions.

In the grape we find two closely allied sugars known to science as glucose and levulose, the relative proportions of which differ according to conditions and degree of ripeness. In very ripe grapes, levulose preponderates. The majority of ferments transform glucose with greater ease than levulose, the fermentation of which is usually looked upon as difficult; nevertheless, certain yeasts are known which ferment levulose with ease. Such should prove of value when dealing with over-ripe grapes.

Lengthy and very technical considerations cannot be fully gone into in an article, such as the present one. Enough has, however, been said to show the absolute necessity of selecting one's yeast, with a view to the composition of the must which it will have to ferment, and the conditions of temperature, &c., under which it will have to do its work, rather than the somewhat sentimental recommendation that it has been selected from some celebrated vineyard in France or Germany. These are considerations which are often allowed to exert an unreasonable amount of weight. It is true that our knowledge is as yet far from perfect on many of these points. These, however, are the main considerations by which one ought to be guided in the choice of yeast. It must be remembered that the composition of the grapes varies considerably from one year to another, so that the yeast most suitable one season may not be so the next. The natural or spontaneous ferment adjusts itself to circumstances, but this is not so with the artificially added one.

Production of bouquet.—Although this is the direction in which the greatest advantages were looked for when pure yeasts were first tried, it is undoubtedly the one in which the greatest disappointments have been experienced. This phase of the question will receive further consideration in the next paragraph.

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* *Dégorgement* is the name given to the operation by which the sediment resulting from the bottle fermentation of champagne is removed prior to recorking the finished wine.

Nevertheless, because the sanguine hopes of twenty years ago were not fully realized we must not lose sight of the real gain which undoubtedly occurs in this direction. Some yeasts, at least, have proved themselves capable of bringing about an improvement in the bouquet of the wines fermented by them.

The advantages to be gained from the use of pure yeasts are summed up by Professor Astruc as follows:—*

1. More rapid, more complete, more regular fermentations and a better yield in alcohol.

2. Wines of better general quality, sometimes clearing earlier and possessing more bouquet; always easier to preserve, poorer in dangerous germs, and clean in taste.

PROBLEMS STILL TO BE SOLVED.

These are numerous and some are important. As regards bouquet, its frequently fugitive nature has led to an ingenious explanation which supposes the existence in the must of certain glucosides or allied substances which give rise, under the influenc of a certain ferment, to a bouquet, whereas under the agency of a different ferment this bouquet would not be evolved. According to M. Astruc—

> It seems as though there were transformation by the yeast of a natural odoriferous element of the must. The Cabernet flavour would transform itself thus by fermentation into the special perfume of Bordeaux, and that of Pinot into the Burgundy perfume; but let us reverse matters, let us place the Burgundy yeast in the Cabernet must and *vice versâ*, and the results as far as bouquet is concerned become uncertain, being temporary or permanent, good or bad, according to the race of yeast employed, or the accidental composition of the must. . . . Is this natural constituent, which has been recognised as depending on the soil and the variety of vine, a special glucoside, or else is this only a convenient way of concealing our present ignorance on the subject? . . . . The only point which seems to me to be solved for one particular spot is that the nature of the bouquet depends on the variety of vine, whilst its intensity seems to depend particularly on the yeast, and that such bouquets are often fugitive or slow in showing themselves when they do make their appearance.

He further points out that, in the quest after bouquet, other risks may be run. "Beware of bouquet-producing levures; they are often 'exigeantes,' lazy, or inferior from other standpoints."

A pertinent question was asked some years back by Duclaux—Is the bouquet of wine due to one ferment alone or to co-operation of several? In Nature a whole group of yeasts does the work. This is quite different to what happens with a pure yeast, which, if it fulfils expectations formed when it was added, is responsible for transformation from start to finish.

It is well known that, in many spontaneous fermentations, the lemon-shaped yeast known as *S. Apiculatus*, so abundant at the commencement, gives place entirely, later on, to the true wine yeast *S. Ellipsoideus*.

The former possesses only poor fermental power, ceasing to act as soon as a moderate alcoholic strength is reached; yet, in some quarters at least, it is held responsible for the production of aromatic substances which possibly contribute to the special bouquet of certain wines. Numerous different varieties of yeasts exist, and it is by no means improbable that in some, at least, of the celebrated wines of the world, it is to the co-operation of several and not to the development of one yeast alone, that are due the qualities which have rendered these wines famous.

These few examples will suffice to show the complexity of the question and the need which exists for further experimental work before the theory

* Henri Astruc—*L'Etat actuel de la Question des Levuers en Œnologie*. Report to the Société des Agriculteurs de France, May, 1908.

of the use of yeasts is put on an altogether satisfactory basis. As Professor Fernbach says, in terminating his report to the Société des Viticulteures de France, in June, 1910—

> You see, gentlemen, that for those who wish to devote themselves to the study of wine yeasts there are yet vast spaces to be explored. I should achieve my object, and I should congratulate myself, if I have been able to awaken in some of you the desire to experiment and thus to bring their small stone to the edifice at which you are all working with so much ardour for the greater profit of the greatest of our national industries—vinification.

PRACTICAL CONSIDERATIONS.

Desirable though complete preliminary sterilization of the crushed grapes, or must, to be fermented may be, no really satisfactory means of executing it, at least on a large scale, has yet been devised.*

Until now the only practical way of employing pure yeasts has been by the early addition of a sufficient bulk quantity of the culture in a state of active growth to rapidly take possession of the mass to be fermented.

As previously pointed out, the partial sterilization afforded by sulphiting (see last issue of *Journal*, pp. 26 and 30) has proved itself to be amply sufficient to give the pure yeast, previously accustomed to life in presence of SO_2, an advantage insuring its development, to the exclusion of all organisms pre-existing in the must. It is not too much to say that sulphiting has thus rendered possible the logical use of pure yeasts. Nothing has contributed more powerfully to the increase in their use in France than the very general adoption of sulphiting. Pure yeasts are supplied commercially in several forms:—

1. *In dilute form.*—The yeast constituting but a small proportion of the total bulk and being largely diluted with the medium in which it was cultivated.
2. *In concentrated form.*—Separated from the bulk of the culture medium, and of a consistency similar to wine lees.
3. *In cultures on gelatine or gélose plates.*
4. *In a dry state.*

Each system has its partisans, and is followed by one or other of the institutions or firms, which manufacture pure yeasts. The manufacturers always supply full directions for use.

Two very different methods of utilizing these cultures must now be considered. The commercial yeast may be added directly, in the form in which it was received, to the crushed grapes or must. This may be termed *Direct Pitching.*† On the other hand, it may be first made to develop, in a small quantity of grape juice, preferably sterilized, either completely, by heat, or partially by the addition of SO_2 (in the form of Sulphurous Acid or Bisulphite of Potash); this intermediate culture, known as a starter (*Pied de Cuve* in French), is used to pitch, or start the fermentation of the large bulk of grapes in the fermenting vat.

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* Brief reference cannot here be omitted to the striking results obtained by several scientists, in the fermentation of sterilized musts with pure yeasts, notably, Kayser, Barba, and Rosenstiehl. Both direct heating and the fractional sterilization first proposed by Tyndall have given good results. Though these authors claim that their methods are applicable on a large scale and several French vineyard proprietors have applied them to very considerable quantities of grapes, they are too cumbersome and complicated to be practical in our cellars or wineries, at least without radical alterations to plants now in use. Several French authors hope for something practical from sterilization by means of ultra-violet rays given out by the Cooper Hewit lamp. None of these methods of compete sterilization have yet reached a stage which can commend them to our practical winemakers, however.

† Pitching is the term used by brewers to designate the addition of yeast, a convenient expression which we may borrow from the sister industry.

DIRECT PITCHING.

This is only practicable in the case of yeast supplied in the dilute form. In any of the others mentioned above, it is not in a sufficiently active state. It is questionable if imported yeast would, even in the dilute form, reach us in an efficient state, after the long voyage. This objection, of course, no longer applies in the case of locally made cultures, which are now obtainable.

In France dilute yeasts are extensively used. M. Jacquemin, of the well-known Institut la Claire, supplies them under the name of *Multilevures-Jacquemin*, specially prepared for the purpose of direct pitching. If desired, they are supplied already acclimatised to the presence of SO_2, for use in conjunction with sulphiting.

The main object of direct pitching is the suppression of the starter and the extra trouble and attention its preparation entails; these often prove irksome in the rush of vintage work.

USE OF STARTERS.

The weight of evidence is decidedly in favour of the starter as opposed to direct pitching. According to most authorities the results it gives will amply repay the small amount of extra work its preparation demands. As we have seen, it is practically obligatory in the case of all forms in which yeasts are sold with the exception of the dilute, recently prepared cultures, referred to in the last paragraph.

In addition to economy* there is another powerful argument in favour of the starter. According to Professor Fernbach—

> It does not seem as though one could, from this point of view (production of bouquet) or many others, expect anything from direct use, that is to say without recourse to a *levain* (starter), because culture in artificial media, most usual in the manufacture of yeasts, causes them to lose the *anthogène* (bouquet producing) faculty, which they only recuperate, partially at least, by passage through grape juice.

M. Ventre, commenting on the above, says:—

> The best proof of the uselessness of direct pitching is to be found in the fact that in all experiments between 1891 and 1902, date of the introduction . . . of starters, combined with the use of sulphurous acid, the results obtained were null, sometimes negative and always inconsistent.

The following practical instructions are adapted from M. Ventre's recent book.†

After pointing out that, theoretically, each vat should have its starter prepared for it a few days before it is filled, he describes a convenient continuous starter which he has devised and which may be employed during the whole currency of a vintage.

> The proportion of starter which has been found to give the best results is from $4\frac{1}{2}$ to $5\frac{1}{2}$ gallons to the ton of fresh grapes.
>
> Hogsheads or pipes, with one head removed, constitute the most convenient receptacles. For a winery treating 35 tons of grapes per day, 5 pipes will be sufficient. This will give some idea of the number required under given circumstances. They should be scrupulously clean, well sulphured and placed on end, on stillages, in a convenient, well-ventilated but not too draughty place, handy to the fermenting pits. Each should have a clean calico or canvas cover, to keep out dust, and be provided with a large wooden tap, at about 3 inches from the bottom.
>
> Two or three days before commencing vintage, gather enough grapes to yield 5 gallons of juice for each ton of grapes to be dealt with on the first day of the

* It is scarcely necessary to point out that a small quantity of purchased yeast, multiplied into a large bulk of starter, must be more economical to use than yeasts prepared for direct addition, a fresh quantity of which must be employed each time.

† Jules Ventre—*Les Levures dans la Vinification*, 1911. Masson and Co., 120 Boulevard St. Germain, Paris.

vintage. These grapes should not be too ripe, they should be the finest and, especially, the soundest available. The must, pressed out rapidly and with every care as regards cleanliness, is immediately placed in the prepared casks.

One-tenth of the juice is then withdrawn and heated to a temperature of 65 deg.—70 deg. C. (149 deg.—158 deg. F.) which is sufficient to render inert the indigenous ferments.

After this has cooled down to 28 deg.—30 deg. C. (82½ deg.—86 deg. F.), introduce the cultivated yeast, in the form in which it is supplied by any of the numerous factories, which now prepare pure yeast.

The remaining nine-tenths are sulphited with a dose capable of assuring their purification and of producing a rapid and complete *débourbage* (separation of mud): *the dose usually recommended is 20 to 25 grammes of SO_2 per hectolitre (equivalent* to between 6½ and 8 ounces of bisulphite of potash to the 100 gallons).

As soon as the one-tenth which was pitched is in full fermentation, usually within twelve to eighteen hours, the clear, sulphited must is added to it, by small quantities at a time, so as not to interfere with fermentation, which would be retarded if too much SO_2 was added at a time. All this ought to be completed and the starter ready, when vintage begins, in order to avoid any delay.

The starter being ready, let us see how it is to be continuously employed during the vintage. This necessitates three distinct operations.

First operation.—Reservation of fresh must, at the rate of 5 gallons per ton. As the fermenting vat is being filled, juice is withdrawn in the above proportion and immediately sulphited with the dose already indicated (6½ to 8 ozs. of bisulphite to the 100 gallons). This is put aside to be added to the starter after completion of the third operation.

Second operation—Sulphiting.—The contents of the large vat are then sulphited as has been previously indicated (see January issue of *Journal*, p. 28). No notice need be taken of the change of colour which takes place.

Third operation—Pitching.—This may be done in two ways. It may be executed at the same time as sulphiting, if this be added progressively, as the grapes come in; or it may be done in one operation, when the vat is full. In the latter case the starter is added after sulphiting, being placed in the tub into which dips the suction pipe of the pump, must from the vat being allowed to flow into the same tub. In this way, by pumping from bottom to top for twenty minutes the yeast is thoroughly mixed throughout the contents of the vat. When this operation is completed the clear, sulphited must, removed by the first operation, is added to the starter, thus restoring it to its original bulk. This addition should not be made until it has thrown its sediment and undergone *débourbage*. Before withdrawing from the starter the liquid to pitch the large vat, it should be well stirred in order to equalize it and avoid an accumulation of sediment, composed mainly of old yeast cells.

The air of the cellar at vintage time being far from aseptic, it is well to add to the starter, from time to time, fresh quantities of pure yeast, so as to maintain the predominance of the race one desires to use.

During the course of fermentation no special care is necessary. This runs its course in the ordinary way, just as though the process were a spontaneous one. It is well here, however, to once more insist on the need for aeration, on account of sulphiting. In our northern cellars, where mechanical pumps are fitted to each vat, aeration is ample, but in cooler districts, where these are not in general use, aeration must be resorted to or there will be some risk of production of sulphuretted hydrogen (taste of rotten eggs) owing to the reducing influence of yeast. This is easily guarded against by pumping from the bottom of the vat to the top. This operation, carried out twice during the course of fermentation, for half an hour each time and with an interval of twenty-four hours between each execution, will be sufficient to avoid any danger (Ventre).

The only danger to which pure yeast may render one liable is a rise of temperature due to the greater activity of the added yeast. Prior to the introduction of sulphiting this frequently gave trouble in warm districts. The restraining effect of SO_2 is a very effectual check. Should trouble occur in this direction, in extra hot weather, the use of a further quantity of bisulphite will suffice to bring the rapidity of fermentation within bounds and avoid injury to the wine.

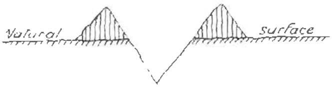
IRRIGATION.

G. H. Tolley, Manager, Wyuna Irrigation Farm.

(*Continued from page* 62.)

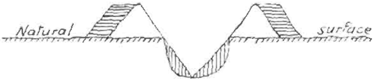
CHANNEL OUTLETS AND HEAD DITCHES.

Upon completion of grading the next step is to provide channel outlets and head ditches for distributing the water. Wherever it is possible make these ditches level, and where otherwise, provide them with regulators so set as to furnish the greatest facilities for securing effective irrigation. The most effective tool for this purpose is the crowder or delver.

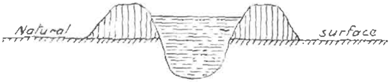


39. SECTION OF CROWDER DRAIN.

After staking out the position of a ditch, plough the surface the full width required, and as deeply as possible, leaving a strip of 6 inches or 9 inches along the centre untouched, to act as a fulcrum for the furrow board of the crowder. The machine is now run along the course of the channel with the wing board (which acts very like the mouldboard of a plough) set rather narrow, the furrow board running straight along the edge of the unploughed strip. The return trip is made along the other side of the strip. This operation crowds the earth out towards the edge of the ploughing. It is repeated with the wing board set wide enough to crowd the earth out to about the position where the bank is required. It may, or may not, be necessary to repeat the work more than twice; it depends upon the nature and condition of the soil and must be left to the judgment of the operator. When the loose earth has all been shifted, the bed is again ploughed and the strip previously left, broken down. This ploughing need not cover so great a width as at first and should be deepest in the centre. The pitch now on the sides of the channel is sufficient to keep the furrow board running in a fairly straight line; to help it do so, the operator can regulate the tilt of the machine by means of the handle provided, while the draught may also be adjusted so as to keep the nose buried as much as may be found necessary. A repetition of the work described as succeeding the first ploughing is all that is required to complete the work. The number of repetitions and the set of the wing board for successive operations may safely be left to the operator, the work naturally being much less in a free loamy soil than in stiff clay, which breaks up in lumps.

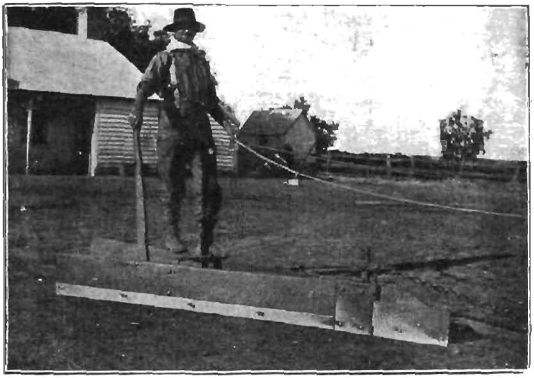


40. CROWDER DRAIN IMPROVED.



41. CROWDER DRAIN COMPLETED.

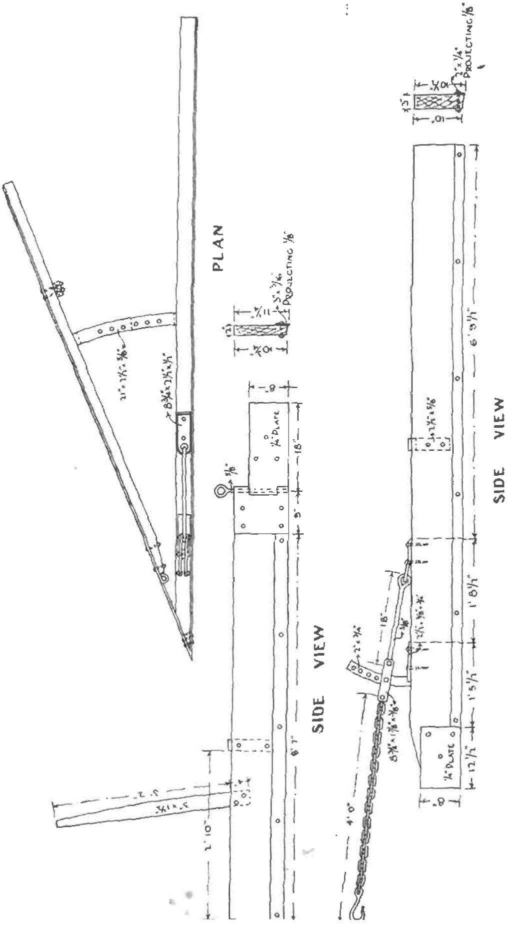
In practice, the driver always rides on the machine and so adjusts his weight and the tilt of the machine as to secure the greatest or least amount of crowding to make a straight even finish. In rough lumpy ground, it is good practice for one man to drive and another to regulate the machine, while it is often necessary that both men ride on it to keep it well buried. It is scarcely a case where a permanent weight can be applied, as it is so often necessary for the position of the weight to be changed. The channel will now have the appearance shown in section in the sketch No. 39, and is quite good enough for all practical purposes. It may, however, be strengthened and made more effective by ploughing out the areas shown in sketch No. 40 by vertical lines, and shovelling the earth into the position shown by horizontal lines. The waterway will be considerably increased and the channel will have the appearance shown in No. 41.



42. THE CROWDER OR DELVER.

The crowder shown on this page, and which is sold for £3 10s., is capable of being drawn by two good horses and is sufficient for the purpose of making the subsidiary channels or head ditches required on most farms. Larger sizes are made and will be found very useful in making channels or drains which will carry considerable volumes of flow. They will be of special value on large holdings and stations, where a few extra horses are of little or no consideration, and where it often happens that flows from artesian bores and other sources of water supply are required to be carried in considerable volume to outlying tanks and storages; or for the purpose of concentrating and accelerating the flow of water along the beds of usually dry water-courses which are of such common occurrence in connexion with the river systems of northern Victoria.

The crowder is also one of the most useful of tools for making road formations. The crowder, buckscraper and smoother (in some cases the crowder and the smoother only) form a superior outfit to the ordinary scoop methods, where surfaces are flat and earth may be borrowed close alongside the formation. If the earth has to be borrowed from the edges

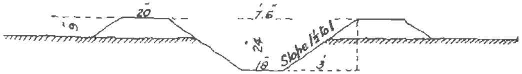


43. THE CROWDER OR DELVER.

This size will be found generally useful on a farm; larger sizes may be had from the makers.

of the road space, the buckscraper and smoother will be found to make a better and cheaper job than scoops, one of the principal advantages being that, with the buckscraper, the loads may be distributed at will instead of dumped in a heap and smoothed afterwards as with scoops.

The question of deciding upon the size of a head ditch must be left very much to individual judgment, but it is always best to have these larger than may be strictly necessary; among other reasons, to allow for siltation and growth of weeds. They should all be made from spoil taken from *inside* the ditch. Taking it from outside destroys so much land, and creates a hideous eyesore, besides causing resort to works of some sort to pass irrigation water across the excavation. If the works are pipes they are expensive, and if of earth and the excavation or borrow pit is any size, they are a nuisance to maintain and cause a good deal of additional labour. Naturally, the size of the ditch is governed by the area to be supplied, the time allowed for applying the water, the kind of watering required, *i.e.*, flooding or by furrows, and the class of soil. As a general idea, a ditch to water an area of 20 acres should be about the dimensions shown in No. 44.



44. SECTION OF HEAD DITCH.

So far there has been very little restriction in the Goulburn Valley irrigation areas as to time allowed for watering; but, as development proceeds and greater demands arise, and the value of water becomes more appreciated, a schedule or roster will be prepared and more rigidly adhered to. An attempt to so regulate the supply of water has been made, but has so far not met with the success that later must become a *sine qua non* of successful irrigation. The water is so regulated in most irrigation countries; and at Mildura, which is eminently a closer settlement area, has generally met requirements. There, the water is all raised from the River Murray by pumps, and, of necessity, costs much more than gravitation water, and the landholders find it to their own interest to assist in preventing any waste from imperfect distribution or other causes. There can be no general law laid down as to time, until experience shall have shown how long particular areas take. Disturbing factors, such as variations of supply in the main channel, changes in planting, rainstorms, &c., can all be left to the judgment of an intelligent ganger. If an area is laid down with some product such as lucerne, which is invariably watered by flooding, it may be finished off more quickly than if it were planted with fruit trees which are usually irrigated by two or more furrows to each row of trees. These methods will be fully explained when dealing with irrigation. Soils, too, vary from loose sand to stiff clay and the porosity of the former, or rather its *seepage qualities*, is very much greater than the latter and consequently the head ditch supply is varied.

In many countries it is usual with irrigators to speak of a stream of water as the equivalent of so many heads, the term "head" being derived from old mining practice where water was measured out for sluicing and other purposes. These heads varied even in the same country, but common consent has defined a head of water as 1 cubic foot per second (usually written *cusec*).

Engineers and water-masters engaged in distributing water rapidly acquire a knowledge at sight of the volume of water flowing in moderate-sized channels. After seeing several streams accurately gauged, and reckoning in cusecs, and applying an old rule (a cusec will water 10 acres of orchard in twenty-four hours), they can tell very nearly what volume an irrigator is using, and whether he is doing so to the best advantage. And it is not long before the irrigator himself becomes quite familiar with cusecs and is able to judge if he is being fairly treated. A cusec, according to the rule stated, is equal approximately to a depth of 1-5th of a foot or 2⅖ inches.

As a guide to those about to lay out a channel or series of ditches for irrigating the following tables are appended, and are computed for side slopes in the ratio of 1½ to 1:—

Discharge in Cubic Feet per Minute of Channel flowing 1 foot deep.

Bed Width.	Fall in Inches per Mile.				
	3 in.	6 in.	9 in.	12 in.	24 in.
1 foot	27	41	53	64	91
2 feet	44	66	84	100	143
3	61	91	117	136	198
4 ,, ...	80	121	154	180	262
5 ,, ..	97	146	187	217	314
6 ,, ...	117	172	223	257	367

Discharge in Cubic Feet per Minute of Channel flowing 2 feet deep.

Bed Width.	Fall in Inches per Mile.				
	3 in.	6 in.	9 in.	12 in.	24 in.
1 foot ..	160	236	296	346	498
2 feet	218	322	402	470	680
3 ,, ...	282	410	516	600	864
4 ,, ...	343	504	624	735	1,050
5 ,, ...	408	597	739	867	1,240
6 ,, ...	479	689	858	1,002	1,440

Discharge in Cubic Feet per Minute of Channel flowing 3 feet deep.

Bed Width.	Fall in Inches per Mile.				
	3 in.	6 in.	9 in.	12 in.	24 in.
1 foot	442	648	803	940	1,353
2 feet	565	819	1,014	1,180	1,696
3	682	994	1,226	1,433	2,052
4	816	1,181	1,453	1,703	2,448
5	946	1,368	1,693	1,972	2,827
6	1,090	1,575	1,937	2,255	3,244

These discharges are computed for earthen channels of regular section and free of weeds, &c. Dividing these results by 60 will give cubic feet per second, or "cusecs."

To select the size of channel within the limits of the Tables for any particular area—An acre comprises 43,560 square feet, and, if watered 12 inches deep, would take the same number of cubic feet of water. A 6-inch watering will therefore take half, or 21,780 cubic feet. Divided by 24 will give the number of cubic feet required per hour; and divided again by 60 will give the cubic feet required per minute, which in this case amounts to 15·125. Multiply this by the number of acres to be served and find the resulting discharge in the Tables, whence the size of channel may be derived; remembering that it is best in head ditches not to have much fall, and in channels not to have them too shallow. If it is desired to water in a less or greater time than 24 hours, use the time selected in making the computation, or if a greater or less depth than 6 inches is required adopt a similar course.

The proper provision of head ditches cannot be too strongly emphasized; and I am entirely with those authorities who decline to deliver water, unless the means of distribution are adequate. Where it happens that a head ditch can be constructed on a level contour little remains to be done beyond providing outlets to the field. The simplest form is to cut gaps in the bank with a shovel and regulate the flow of water by means of

45. OUTLET FROM HEAD DITCH.

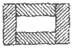
clods, pieces of sacking, bunches of weeds, &c. It is rather a slovenly practice and results in unsightly holes accumulating, but it is effective and certainly permissible where means are limited. The better plan is to provide some kind of pipe of suitable capacity and length, the latter being governed by the width of the ditch bank. If circular pipes are used plugs of some kind must be provided, to regulate the discharge. Preferably, these should be of cork; wooden plugs often swell and get jambed and in the process of removing them many pipes are displaced or damaged or broken. The plug should appear wedge-shaped in section as shown in No. 46 and be slightly tapered, which admits of regulating discharges to any volume desired within the capacity of the pipe.

46. PLUG FOR PIPE.

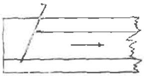
47. ANOTHER FORM OF PLUG.

If the supply of water only reaches the top of the pipe the plug should be turned sideways. Another plug is made by covering the mouth of the pipe with an old jam tin which either just fits inside or outside the pipe and in which a cut has been made in one side as shown in No. 47; a hoop-iron handle is attached, the lugs of the handle projecting beyond the edge of the tin to prevent it slipping into the pipe when used inside. The form of the aperture allows of a very nice adjustment of flow.

48. SECTION OF OUTLET.



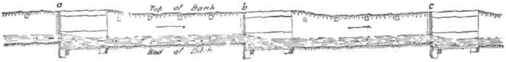
49. SECTION OF OUTLET NOT RECOMMENDED.



50. LONGITUDINAL SECTION OF OUTLET.

Pipes may be either earthenware, iron (old water pipes), galvanized iron (downpipe), or wood. The first and third classes are not to be recommended as they are easily damaged. The second class is practically everlasting; secondhand water or steam pipes are procurable in some places at cheap rates. Square wooden pipes are very serviceable and durable; they are easily made and regulated, and are on the whole to be preferred. I use them made of red-gum, 4 inches x 1¼ inches, put together as shown in No. 48 to give the greatest waterway. If built as shown in No. 49 the area is 20 per cent. less. The inlet is made as in No. 50, the diagonal piece being a shutter made of stiff galvanized iron sliding in saw cuts made in the wood, the top or cover board terminating at the shutter. These pipes,

spaced 15 feet apart, are sufficient as outlets for irrigating lucerne, and when watering orchards, one for every row of trees in fairly stiff soils; the irrigator will soon find the size and spacing best adapted to his particular circumstances.

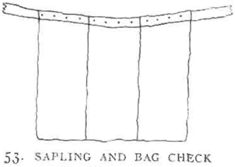


51. LONGITUDINAL SECTION OF HEAD DITCH WITH FALL.

Where it happens that a head ditch has to follow the fall of the country, it should be constructed like a series of steps with long treads and short rises, or in this case "falls," as in No. 51, a suitable check being fixed at the points *a*, *b*, *c*, &c. There is no need to excavate the ditch to this staircase section. So long as the checks are properly fixed, the water will usually scour the bed to a normal condition. The greater the surface fall

52. CHECK IN HEAD DITCH SHOWING POSITION OF SAPLING.

the greater the number of checks and, with a slight inclination, the converse is the case. If the ditch simply conveys water for the supply of some subsidiary ditch, the checks should be made deep, and consequently few, but if acting as a head ditch solely, the steps should be successively from 4 inches to 6 inches lower, but much depends on the nature of the ground and the purpose for which it is used.

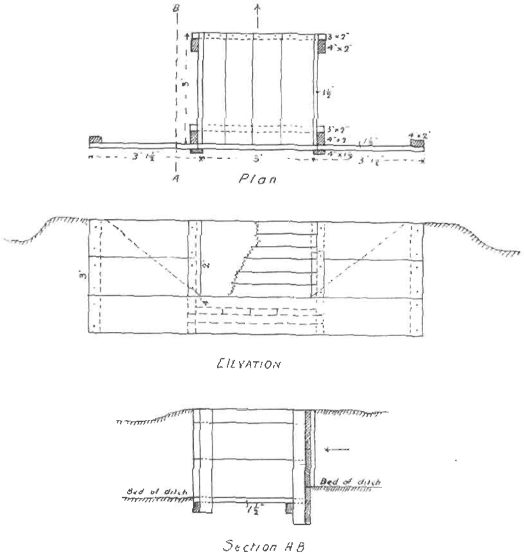


53. SAPLING AND BAG CHECK OR REGULATOR.

54. SAPLING REGULATOR IN POSITION.

The simplest and cheapest form of check is made of a sapling and bags; substitutes will readily suggest themselves. The sapling should be about 2 inches in diameter and long enough to reach well across the banks and, preferably, should be slightly curved in the centre (No. 52). The bags should be sewn together, and one edge of the cloth thus made nailed to the sapling and wound once or twice around it (No. 53). The ends of the sapling are bedded in the banks of the ditch to such depth as may conveniently deal with the water; and the cloth is stretched along the upstream bed of the ditch and kept in position with a few shovels of earth thrown in on top along its edges, to prevent any escape of water beneath (No. 54). Such checks will be found very effective in practice, and are readily removable from place to place as desired; but it must be understood that where the fall of the ditch is so considerable as to set up excessive scour some per-

manent check must be constructed as soon as convenient. Bag checks should not be allowed to remain in the ditch after watering is completed, or the bags will soon decay. Either take them away and store them, or hang them on a fence to dry.



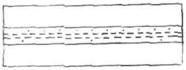
55. TIMBER DROP REGULATOR.

Another very serviceable check may be made with bags of earth, small bags such as sugar bags are the best, being easy to handle. Built across the course of a ditch in the same way that bricks are laid, leaving a waterway at the top in the centre, they will be found good temporary appliances. Except for the cost, permanent timber checks are much to be preferred. Various kinds of masonry checks are the most permanent of all, but they are impossible of removal. Iron may be used, but is expensive, and liable with the best of coating to rapid decay.

There are many designs for making timber checks, but I find the above (No. 55), which is in use in the ditch illustrated in sketch No. 51, answers all purposes and is cheap.

Red-gum timber is used on account of its durability and freedom from the attacks of white ants. It is generally received from the saw mills in a green sappy condition, and when put together it should be placed in position at once and well coated with hot tar. Even then the joints, and

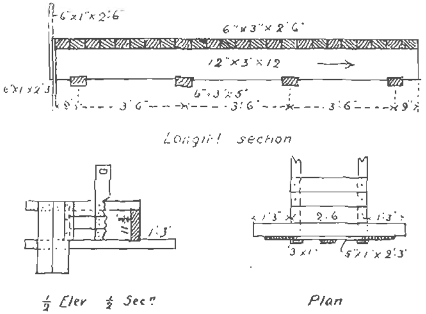
especially where exposed to the sun, often open so much as to allow the passage of a very material quantity of water. If this becomes excessive, cover the openings on the side bearing pressure with narrow strips of tin or galvanized iron, as shown in No. 56. If tin is not available, use wood with strips of felt or sacking.



56. COVER FOR LEAKY JOINT.

Scour of the sides of a ditch is often set up immediately below a check or culvert, but may be obviated by means of short basket wings made from tree or vine prunings, or, preferably, by facing with a few barrow loads of broken stone or bricks.

In the case of long head ditches, where it may be desired to concentrate water at some special place, timber regulators of the same design as the drop shown on page 123, but omitting the step, may be introduced. These structures will serve as patterns from which larger or smaller ones may be made, and when in doubt as to the strength of the timbers for larger designs a hint may be had from the checks and bridges in existing channels or reference made to the nearest shire engineer.

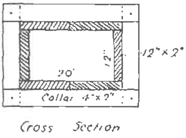


57. REGULATING CULVERT.

Crossings over ditches for the passage of waggons or implements may be made with hollow logs or of red-gum or other timber to the design (No. 57); decking to be secured by 6-inch Ewbank spikes, driven in ⅜-inch auger holes, all timber to be treated with tar applied hot. It often happens that a culvert is required to act as a regulator, in which case a light sliding door may be fitted to the upstream end, wing-boards and cleats being nailed to the ends of the deck and stringers for the purpose, as shown in the drawing. There is no necessity to make the area of culvert equal to area of waterway; in most cases, it would involve too great expense for timber. The design given will serve ordinary head ditch purposes, and it would be well not to contract such crossings too much.

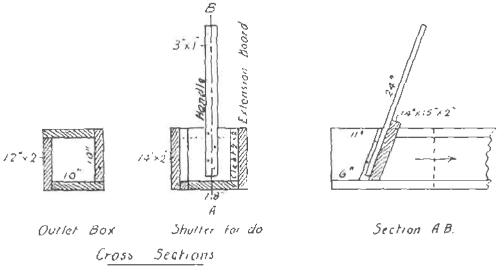
Outlets from main channels for supplying water to irrigators are of various design, and are usually supplied by the authority controlling the main works. The number allotted is governed by the area and contour of country operated, but an owner may insert more at his own cost, and under supervision. Where meters are used, these outlets are expensive

structures, and, seeing that as yet no meter has been produced to satisfy *practical* requirements, it is doubtful if the expense is justified. Outlet boxes made as shown in drawing No. 59 are effective and cheap. They are usually so located that they are not called upon to bear heavy traffic, and the timbers used in their construction need not exceed 2 inches in thickness. Where so great an area of waterway is required as to necessitate the use of more than single planks, collars as shown in sectional drawing No. 58 will give strength and act as flanges to check any tendency there may be for water to creep along the sides.

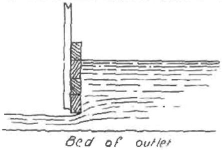


58. OUTLET BOX.

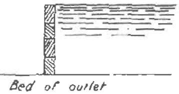
If the ground is very sandy the width of collars can be increased by adding extra boards. The length will be governed by local circumstances. Shutters may be of similar design as for culverts (see No. 57), or, preferably, as in drawing No. 59. Being set at an angle they are more readily operated from bank of channel, make a closer joint, and the earth stopping lies up better to them. Outlets of this description, if well rammed, will rarely wash out. In designing outlet boxes, it is desirable that the greatest dimension shall be *width*, for the reason that more water may be available when a supply channel is low, than if the principal dimension was *depth*: and all outlets should deliver water underneath the shutter or regulating bars. If bars or shutters are set to take water over the top, the supply channel may fall so low that no water can be delivered, whereas, with underflow, the last drop in the channel may be utilized, as shown in drawings Nos. 60 and 61. *(To be continued.)*



59. DESIGN FOR CHEAP OUTLET BOX.



60. MOVEABLE SHUTTER.



61. MOVEABLE BARS.

PREVENTION OF POTATO BLIGHT BY SPRAYING.

D. McAlpine, Vegetable Pathologist.

In the leaflet issued by the Department of Agriculture and Technical Instruction for Ireland on the Prevention of Potato Blight, the value of spraying is shown in the results of experiments, and the following statement regarding its utility is made:—"The experience of recent years has conclusively proved that the loss caused by potato blight can be, to a great extent, prevented by spraying—an operation which has now come to be regarded as an essential part of the work connected with the successful cultivation of the potato crop. The reports received by the Department from a large number of districts show that those who take the trouble to carry out the work properly are abundantly rewarded, while those who neglect to spray suffer heavy loss, both in the quantity and quality of the crop."

SULPHATE OF COPPER AND WASHING SODA RECOMMENDED AS A SPRAY.

The spraying mixtures recommended are either of the two following:—

1. Sulphate of copper or bluestone and washing soda.
2. Sulphate of copper and lime.

The former is recommended by preference for the following reasons:—

1. It adheres longer to the foliage of the plants, and is not so readily washed off by rain,
2. It is more easily prepared.
3. It is not so liable to clog the nozzles of the machine, because if the mixture is carefully prepared there should be no sediment.

PREPARATION OF THE MIXTURE.

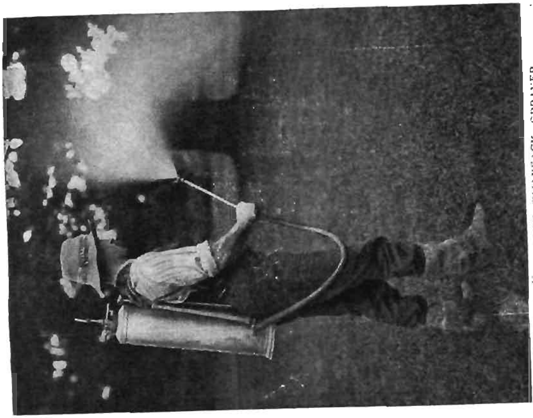
The mixture is made in the following proportions:—

8 lbs. sulphate of copper.
10 lbs. washing soda.
40 gallons water.

The sulphate of copper is dissolved in a barrel or wooden tub, because the solution has a corrosive action on metal. Pour into the barrel 35 gallons of clean water. If there is any grit or foreign material in the water it should be strained through a piece of hessian, so that it does not clog the nozzles of the sprayer.

The 8 lbs. of sulphate of copper should be tied up in a piece of hessian and moved about in the water in the barrel until the crystals are all dissolved. The operation is hastened if the crystals are previously ground.

Next dissolve the 10 lbs. of washing soda in five gallons of water in a separate vessel. Then pour the washing soda solution slowly into the copper sulphate solution in the barrel, stirring continuously, and the mixture is ready for use. If convenient to have hot water, both the sulphate of copper and the washing soda can be more quickly dissolved, and the required quantity of cold water can afterwards be added. A quarter of a pound of Paris green may be added to the 40 gallons if it is desired to destroy grubs as well. There is no harm in dissolving the sulphate of copper and washing soda in separate vessels and keeping them in that condition for several days, but once they are mixed together, the mixture should be applied *immediately*. The mixture deteriorates rapidly even when held over for one day, and is then much more readily washed off the



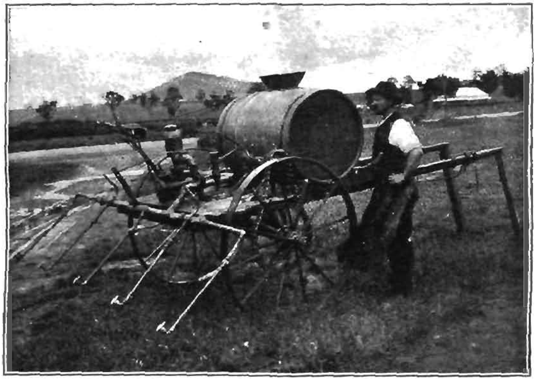
"AUTO" SAFETY KNAPSACK SPRAYER.

COPPER KNAPSACK SPRAYER.

plants by rain. The freshly made mixture should always be used. Sulphate of copper is poisonous, therefore the vessels in which the mixture has been prepared should not be used for holding food or water for consumption.

APPLICATION OF THE MIXTURE.

Spraying should be done before any signs of disease have appeared. It is desirable to apply the first dressing when the plants are about 6 inches high, although leaves are sometimes blighted as soon as they appear above ground. A second spraying should be given when the foliage is well developed, and if the season is a wet one, a third dressing may be advisable. The foliage should be completely covered by the spray in the form of a fine mist, and this is best done when a sufficiently high pressure is maintained in the sprayer. Spraying should be done during dry weather and suspended when it is raining. If heavy rain has washed the mixture largely off soon after spraying, then it should be repeated.



FORBES-CHISHOLM HORSE-POWER SPRAYER.

It is essential to success that the spraying material is kept intimately mixed by constant agitation during the operation.

QUANTITY PER ACRE AND COST OF MATERIALS.

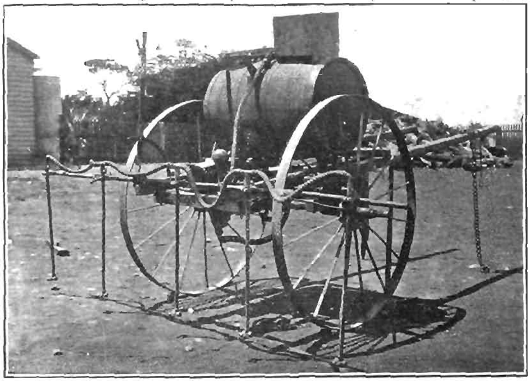
It is found in Ireland that an average crop with fully developed foliage requires about 100 gallons per acre, and with a small amount of foliage the quantity would be less. The quantity will vary, but the main point to be attended to is to use sufficient to completely cover the foliage without drenching the ground.

At the present market price of the articles when bought in quantity, the cost of the raw materials of spraying an acre would be as follows:—

Sulphate of Copper, 20 lbs. at 2d. 0¾d. per lb. =	4s. 7d.
Washing Soda, 25 lbs. at 0⅝d. per lb. ... =	1s. 5d.
Total	6s. 0d.

FIELD TRIAL OF SPRAYING MACHINES.

In order to show the sprayers at work, several of the best machines were tested at Bungaree. They were of various patterns and prices to



FLEMING'S HORSE-POWER SPRAYER

suit the small as well as the large growers. There is a knapsack sprayer adapted for areas of only a few acres; and a powerful machine, such as

SPRAYING WITH THE FLEMING MACHINE.

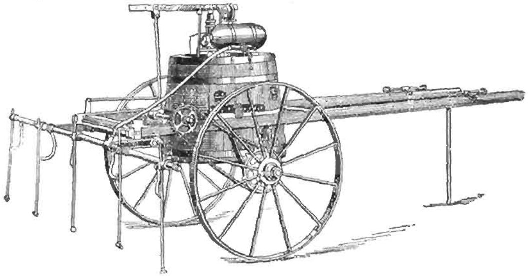
the motor spray pump, which can be used for spraying the most extensive plantations as quickly as possible.

The larger machines were charged with 40 gallons of the copper-soda mixture and the application of the spray, together with its regular distribution over the crop, was closely followed by over 200 farmers. Each machine sprayed five rows at a time and 100 gallons would cover from 1 to 1½ acres. Of course, more extended trials would be necessary to test the capabilities of each machine for spraying cheaply, quickly and effectively and no attempt was made to place them in order of merit, although the performances of each were keenly discussed.

The following machines were exhibited in action and the accompanying photographs will give a good idea of their general structure and mode of working.

1. *Knapsack Sprayers.*—A copper Knapsack Sprayer is shown, capable of holding 5 gallons and is to be preferred to one made of galvanized iron, because the iron extracts the copper from the mixture and thereby renders it less efficacious. The cost is from £3 upwards.

The other represented is known as the "Auto" Safety Sprayer and is made of galvanized steel, with asphaltum paint inside. The cost is £3 for 2-gallon size and £6 for 5-gallon size.



L. B. & D. AUTOMATIC HORSE SPRAYER.

2. *Forbes-Chisholm Horse-power Sprayer.*—This machine is made at Bungaree and when barrel is full, containing 100 gallons, weighs 11 cwt. It is built on steel wheels with steel axle adjustable, also fitted with ratchet gear for turning and driven with chain from centre of axle off sprocket wheel. The pump is driven with eccentric and can be used to fill the barrel instead of bucketing, thus saving time and extra help. The pump is brass lined, double action and fitted with air-chamber, a continual stream of water being forced back into the barrel; the solution is thus kept well agitated. The machine is adapted to do 5 or 7 drills at a time and the nozzles are adjustable. The spray is circular and can be regulated to any angle. The droppers of the sprayer are fitted with swivel joints and are not injured by striking any obstacle.

Every machine is thoroughly tested before being sent from the factory and the complete cost is £25. The machine has been improved upon since photograph was taken.

3. *Fleming's Horse-power Sprayer.*—This is a comparatively light machine as the weight is about 10 cwt. when the barrel is full. The

wheels can be moved in or out to suit the width between the rows. The spray never comes in contact with iron, as it passes through brass, armoured hose and a copper tube. The armoured hose is warranted not to collapse. By means of a couple of levers easily controlled, the sprays are lifted at the end of the rows and the mixture is, at the same time, cut off at the tank. As soon as the machine is in position for spraying the next set of rows, the levers are reversed and a fresh start is made. Duplicates of the different parts are kept in stock, so that they are easily replaced when necessary. The complete cost is £30.

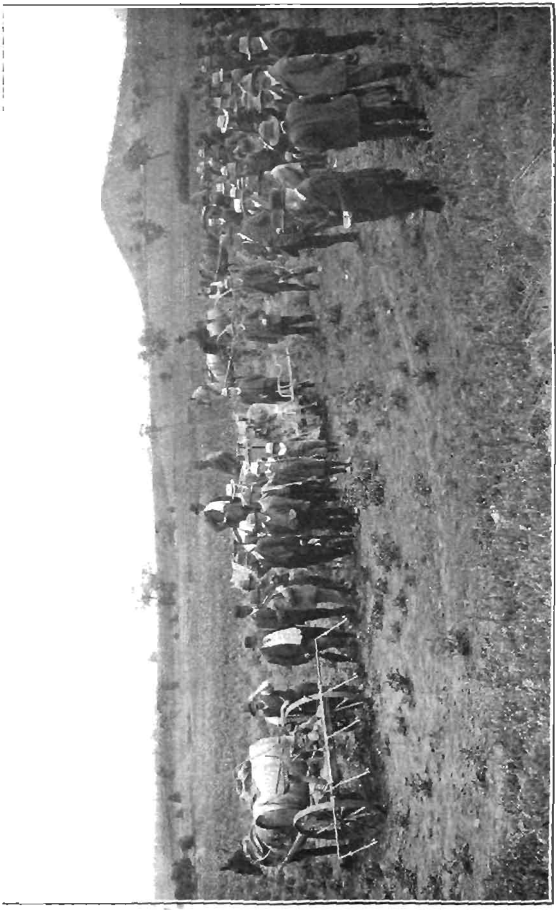
4. *Strawson's Cart Sprayer.*—The pump is of gun metal provided with an agitator. It can be readily fitted to an ordinary dray and the pump is worked by hand. The cost of the sprayer with three droppers is £15 and with five droppers £17 10s. If fitted with automatic gear, so that hand-power is dispensed with, the cost is £5 extra.

L. B. & D. MOTOR SPRAYER.

5. *L. B. and D. Automatic Horse Sprayer.*—This pump has a two-inch double action and is composed of gun metal. It is mounted on large transports driven by sprocket and chain gear. The droppers are five in number, with double sprays at the bottom and a single spray at the top. The gear can easily be thrown in and out at the end of the rows. The vat holds 80 gallons and the price is £35.

6. *L. B. and D. Motor Sprayer.*—This consists of an engine, pump and vat. The engine runs at 500 revolutions which is considerably under any other motor and has a pressure from 150 to 300 lbs. It is fitted with a governor, which enables it to run at any desired speed, and has a magneto instead of a battery. The engine can be completely disconnected in five minutes and may be used for other work, such as chaff-cutting, pumping water, &c. Cost of the engine, £36.

It is attached to two 2¼-in. plungers and the pump has a triple agitator. The droppers of the sprayer are on the stump-jump principle and have also guards to protect the sprayer. The vat is U-shaped to allow of



GENERAL VIEW OF SPRAYERS READY FOR WORK.—STRAWSON'S CART SPRAYER AT EXTREME RIGHT.

thorough mixing of the ingredients. It holds 80 gallons and when fully charged, the entire weight is about 12 cwt.

Cost of engine, pump and sprayer, £65; and if mounted on a cart as in photograph, £75.

The machines are manufactured by Messrs. Langwill Bros. and Davies, Melbourne; Messrs. Edwards and McGinness, Melbourne; and Mr. W. H. Chisholm, Bungaree.

ANSWERS TO CORRESPONDENTS.

The Staff of the Department has been organized to a large extent for the purpose of giving information to farmers. Questions in every branch of agriculture are gladly answered. Write a short letter, giving as full particulars as possible, of your local conditions, and state precisely what it is that you want to know. ***All inquiries forwarded to the Editor must be accompanied by the name and address of the writer.*** This is very necessary, as sometimes insufficient information is furnished by the inquirer.

FARMING ON "SHARES."—T.N. writes:—"*Re* terms of wheat growing on shares where the farmer takes two-thirds and the owner of the land one-third of the crop. I understand that the owner supplies the land, buildings, fencing, &c., and the farmer everything else, including labour, of course. Is this correct? Also, who has the right to graze the stubble?"

Answer.—Yes. The grazing of stubble is a matter of arrangement. Usually the farmer has the right of using the stubble and straw. It is a common practice for the landlord to allow the farmer a lump sum (to be agreed upon according to the stage of growth and quantity of stubble available for grazing purposes) for the right to graze the cultivated area for a given period.

CREAM TESTING.—DAIRY asks what protection suppliers of cream to butter factories have.

Answer.—Section 33 of the *Milk and Dairy Supervision Act* states:—"Any vendor of milk or cream shall have the right to have his milk or cream tested in his presence at the factory not oftener than once a week." Other than this, there are no legal provisions to insure the accuracy of the returns of butter fat contents of cream or milk sent to a factory.

LAMINITIS.—J.K. states that his pony got a feed of oats by mistake. He became lame at once, or "foundered." The pony is getting worse—the hoofs have grown very much, and he is hardly able to walk about.

Answer.—The trouble is Laminitis or Founder, followed by a condition of "dropped sole," and is beyond cure. In such cases the use of "rocker" shoes on the affected feet is necessary. Laminitis is described fully in the *Journal* for July, 1907.

RUPTURE.—W.R.W. writes:—"I have a valuable draught mare that appears to have developed a broken belly. It began about a month before she foaled, which occurred eight days ago. The swelling has practically gone, but the broken belly is apparent. She seems to have trouble in urinating. She has been bandaged until a few days ago. Is it advisable to keep a bandage round her?"

Answer.—The mare evidently has hernia, or rupture of the belly wall. It will depend on the extent as to whether it is curable or not. In any case, the operation is one for an expert only, and would involve considerable risk to the mare. In the circumstances, the best plan is to continue the bandage treatment for some weeks or even months, but before applying it attempts should be made to locate the hole in the belly wall and to return the bowel through it into the belly before the bandage is fixed. The bandage should be strong, broad, and re-adjusted as often as required through displacement. Blistering is not advisable.

ABORTION.—J.B. asks whether smutted oaten hay, or chaff cut from same, would, if fed to in-foal mares, cause them to abort.

Answer.—Oat smut would not necessarily cause abortion, but, owing to the fact that the nutrient portion of the fodder is attacked, and for the most part destroyed, it is deprived of its nutrient properties. Consequently, the mares would not do as well as with sound fodder. Further, there is some risk that digestive disturbance might set up from eating large quantities of the damaged fodder, and this would act deleteriously on the pregnant womb and possibly in an indirect way lead to abortion.

LUMP ON JAW.—A.B. states that his horse has had a lump under its jaw for years. It appears to increase as the horse improves in condition, and to decrease to nothing when poor.

Answer.—It is impossible to express a definite opinion as to the nature of the lump mentioned without a manual examination. The alternating appearance and disappearance with varying bodily condition is suggestive of nothing more than increased prominence being given to the glands under the lower jaw as the horse thrives, which is due to the deposition of fat in the region. As the fat is used up when "condition" is lowered the glands shrink back into the space between the branches of the lower jaw. If the swelling shows a tendency to increase and remain permanent you should have the horse examined by a veterinary surgeon to determine the exact nature of the swelling.

LAMB-RAISING.—C.A.H. asks for information on several points in connexion with lamb-raising.

Answer.—In a healthy district, when fairly treated, good crossbred ewes return 5s. to 6s. each in wool and 10s. to 13s. for the lamb; or £26 per 100 for wool and £45 per 100 for lambs. The age at which a lamb would be market fat depends on the class of ewe and the type of ram mated; 12 to 14 weeks old weighing 28 to 36 lbs., if from coarse crossbred ewes by thick-set Shropshire rams. Lucerne, both green and silaged, is suitable for sheep, but proper fixtures are necessary in feeding silage economically. Lucerne, if grazed, should not be eaten bare.

STABLE MANURE FOR POTATOES.—H.H.H. asks what quantity of stable manure per acre would be necessary for growing potato crops on alluvial flats.

Answer.—The quantity depends on the nature of the soil and length of time under cultivation. Rich alluvial flats that have been under pasture for a long period should yield a satisfactory crop of potatoes without manure; if under cultivation for a number of years, 10 to 15 tons per acre. Less fertile flats, under similar conditions, would require 15 to 20 tons per acre.

"RED-SKIN" POTATOES.—R.A.O. asks what is the colour of a true "Red-skin" potato.

Answer.—The colouring matter of the true Red-skin is red. The skin of this variety is rough and netted, consequently the colour is not very marked except when just dug. The colouring matter of the Brown's River variety varies from pale purple to violet. Potatoes of this variety are called "Reds" more on account of being grown on red soils; they are sometimes called "Blues."

FARMYARD MANURE.—H.H.H. wishes to know whether farmyard manure should be ploughed in when fresh to obtain the best results.

Answer.—As a general rule the manure should be carted direct from the stable or cow yard on to the field, spread out there in long narrow strips, and ploughed in about once a fortnight. In this way a succession of fodder crops can be successfully grown for all kinds of stock.

WIRE NETTING.—H.H.H. inquires as to prices and terms upon which the Government supplies wire netting to settlers.

Answer.—The price of the netting (42 in. wide, 17 gauge, 1½-in. mesh) is £22 10s. per mile, delivered at Wharf or Spencer-street Railway Station. The terms allowed are ten years (unless otherwise agreed upon) with interest, at 4 per cent., on the outstanding balance, but an applicant may pay in full at any time. If the land is held under a lease or licence or it adjoins unoccupied Crown lands, application should be made to the Secretary, Lands Purchase and Management Board, Melbourne, otherwise it should be made to the local Shire Council, who will supply it on exactly the same terms.

RABBIT DESTRUCTION.—H.H.H. asks whether the Government supplies carbon bi-sulphide for rabbit destruction at reduced rates.

Answer.—The Government does not supply any material whatever.

PRUNING.—R.A.O. asks whether, in pruning fruit trees, the cut should be made just above the bud which it is desired to leave or through the bud above.

Answer.—Cut just above the bud you wish to use as a leader, sloping the cut in the opposite direction to the bud.

WOOLLY APHIS.—P.McK. asks for remedy for treating trees affected with Woolly Aphis.

Answer.—Trees should be sprayed with tobacco decoction twice, at an interval of about a month to allow those aphides on the ground to have ascended; 1 lb. of waste tobacco, soaked in about 3 gallons of water for a week or so, will be found effective as a spray.

SCALE ON LEMON TREES.—J.D. inquires as to treatment of scale on lemon trees.

Answer.—Red oil emulsion, 1 in 45, is recommended. Spray in cold weather.

PUBLICATIONS.—A.F.B. asks for list of books dealing with orchard work and root crops.

Answer.—The following are recommended :—*The Principles of Fruit Growing* (Bailey), 6s. *The Principles of Vegetable Growing* (Bailey), 6s. *Pictorial Practical Gardening* (W. P. Wright), 1s. 9d. *Pictorial Practical Fruit Growing* (W. P. Wright), 1s. 9d. These works are obtainable at leading booksellers.

RAISING CITRUS TREES FROM SEED.—R.E.D. inquires whether there is any special way of raising citrus trees from seed.

Answer.—Seeds must not be allowed to become too dry. Fresh seeds are the best. Sow them in a very light sandy soil. Citrus seedlings are of no use whatever for fruit-bearing trees, and they are of very little use as stocks.

STATISTICS.

Rainfall in Victoria.

FOURTH QUARTER, 1910.

TABLE showing average amount of rainfall in each of the 26 Basins or Regions constituting the State of Victoria for each month and the quarter, with the corresponding monthly and quarterly averages for each Basin, deduced from all available records to date.

Basin or District.	October.		November.		December.		Last Quarter.	
	Amount.	Average.	Amount.	Average.	Amount.	Average.	Amount.	Average.
	points.	points.	points.	points.	points.	points.	points.	points
Glenelg and Wannon Rivers	253	288	230	185	243	139	726	612
Fitzroy, Eumerella, and Merri Rivers	288	290	231	191	277	148	796	629
Hopkins River and Mount Emu Creek	245	252	202	192	215	156	662	600
Mount Elephant and Lake Corangamite	287	243	210	190	248	153	745	586
Cape Otway Forest ...	375	342	324	234	397	211	1,096	787
Moorabool and Barwon Rivers	286	244	242	194	218	183	746	621
Werribee and Saltwater Rivers	263	241	240	191	243	214	746	646
Yarra River and Dandenong Creek	471	330	366	263	367	317	1,204	910
Koo-wee-rup Swamp ...	428	341	315	249	371	261	1,114	851
South Gippsland	444	382	320	262	469	312	1,233	956
Latrobe and Thomson Rivers	428	361	374	258	567	290	1,369	909
Macallister and Avon Rivers	273	231	319	178	268	270	860	679
Mitchell River	283	284	326	192	331	241	940	717
Tambo and Nicholson Rivers	216	305	359	168	251	280	826	753
Snowy River	378	353	391	198	258	280	1,027	831
Murray River	130	186	201	133	107	142	438	461
Mitta Mitta and Kiewa Rivers	267	340	352	249	355	233	974	822
Ovens River	204	344	370	228	257	228	831	800
Goulburn River	183	246	223	178	363	176	769	600
Campaspe River	170	210	225	165	170	175	565	550
Loddon River	124	173	182	140	116	121	422	434
Avon and Richardson Rivers	99	148	122	123	62	89	283	360
Avoca River	118	154	133	129	93	109	344	392
Eastern Wimmera	155	205	170	161	123	113	448	479
Western Wimmera	163	202	188	139	128	78	479	419
Mallee District	109	122	151	93	77	80	337	295
The whole State	218	235	238	168	222	163	678	566

,00 points = 1 inch.

H. A. HUNT, *Commonwealth Meteorologist.*

Perishable and Frozen Produce.

Description of Produce.		Exports from State (Oversea). Quarter ended 31.12.1910.	Exports from State (Oversea). Quarter ended 31.12.1909.	Deliveries from Government Cool Stores. Quarter ended 31.12.1910.	Deliveries from Government Cool Stores. Quarter ended 31.12.1909.
Butter ...	lbs.	25,253,752	19,274,028	19,941,600	12,505,216
Milk and Cream ...	cases	801	254	80	203
Cheese	lbs.	264,840	19,920	255,172	4,410
Ham and Bacon ..	"	46,560	...	...	..
Poultry	head	9,879	330	5,489	3,276
Eggs...	dozen	30	...	3,811	266
Mutton and Lamb	carcases	998,883	616,474	113,287	147,851
Beef	quarters	2,759	1,558	...	..
Veal .. .	carcases	1,468	866	343	103
Pork...	"	1,078	...	851	71
Rabbits and Hares ...	pairs	5,490	42,252	3,804	16,476
Sundries	lbs.	...	...	80,296	13,676

R. CROWE, *Superintendent of Exports.*

Fruit, Plants, Bulbs, Grain, &c.

Description of Produce.	Imports. Inter-State.	Imports. Oversea.	Exports. Inter-State.	Exports. Oversea.
Apples ..	38,699	81	3,519	7
Apricots ...	—	—	1,032	312
Bananas, bs.	65,744	—	—	—
Bananas, cs.	15,898	—	2,596	6
Barley ..	10,706	—	—	—
Beans ...	125	108	—	—
Bulbs ...	—	197	4	—
Cherries ...	4	—	24,157	3,992
Chillies ...	11	152	—	—
Cocoa beans	—	951	—	—
Cocoanuts..	—	—	1	—
Coffee beans	—	498	—	—
Copra ...	—	205	—	—
Cucumbers	8,746	—	678	10
Currants ...	—	2,831	—	-
Dates ...	—	16,573	—	-
Figs ...	-	875	4	-
Fruit—				
Canned ...	—	—	—	1,861
Dried ...	—	83	—	1,048
Mixed ...	4	34	1	-
Garlic ...	2	—	—	—
Gooseberries	—	—	489	—
Green ginger	—	169	—	—
Hops .	—	575	—	—
Jams, Sauces, &c.	—	—	—	1,143
Lemons ...	4,727	1,200	—	1,674
Lentils ...	—	37	—	—
Linseed ...	5	51	—	—
Totals ...	144,671	24,620	32,481	10,053

Description of Produce.	Imports. Inter-State.	Imports. Oversea.	Exports. Inter-State.	Exports. Over[sea]
Loquats ..	340	—	55	
Mace ...	—	1[illegible]6	—	
Maize ...	384	9	—	
Melons ...	35	—	546	
Nutmegs ..	—	152	—	
Nuts ...	104	2,152	629	
Oats ...	1,121	51	—	
Oranges ...	75,483	973	—	
Passion ...	533	—	163	
Paw-Paws...	49	—	—	
Peaches ...	—	—	479	
Pears ...	—	—	420	
Peas, Dried	589	202	—	
Pepper ...	—	84	—	
Pineapples	20,079	—	1,135	
Plants, Trees, &c.	616	177	385	
Plums ...	—	200	2,440	
Potatoes	4	—	—	
Raisins ..	—	609	—	
Rice ...	3,544	13,543	—	
Seeds ...	578	4,902	—	
Spice ...	—	85	—	
Strawberries	1	—	2	
Sugar Cane	—	4	—	
Tomatoes ..	4,131	—	135	
Vegetables	5,582	414	94	
Wheat ...	975	—	—	
Yams ...	134	—	—	
Grand Totals	258,953	48,303	38,964	1

Total number of packages inspected for quarter ending 31st December, 1910 = 358,32

... *Fruit Imports and Exp*

THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

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NORTHERN GRAIN EXPERIMENTAL FIELDS.

I.—REPORT ON HARVEST, SEASON 1910-11.

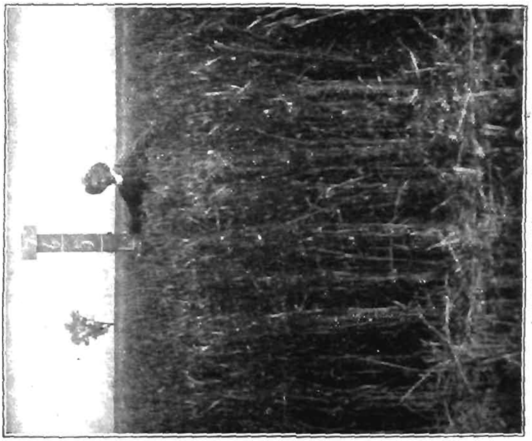
J. M. B. Connor, Agricultural Superintendent.

This report deals with the results of the sixth year's field trials carried out upon the experimental plots to be conducted for seven years under agreement with the Department throughout the Northern wheat areas. One of the principal objects of these experimental plots is to endeavour to ascertain, by practical demonstration on the farmer's own land, the advantages to be gained to the particular district by the introduction of new varieties of wheats and other cereals likely to yield greater returns per acre; as against varieties grown locally by the district farmers under the same conditions, and to arrive at some reliable determination as to the relative advantages of the various manures.

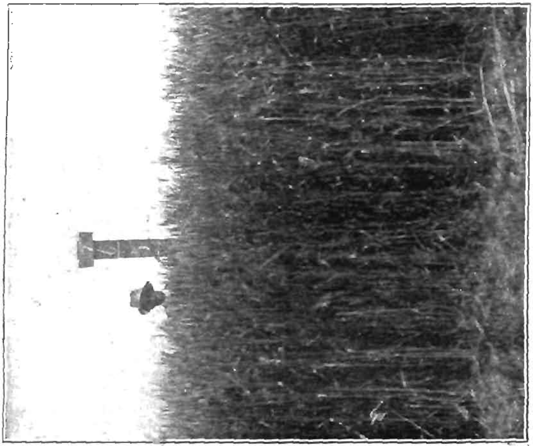
The experimental fields at present being worked under the supervision of the Field Branch of the Department of Agriculture comprise a total area of 531 acres as against 335 acres last year and may be classified as follows:—

	Acres.
Northern area wheat fields	277
Maize and forage crops	79
Subsidy plots	157
Potato plots	8
Soya beans	10
Total	531

The wheat fields are carried out under arrangements which admit of cropping over seven consecutive years and are devoted chiefly to variety seed tests, fertilizer tests, quantity seed tests, and rotative courses. The forage fields comprise cereals, millet, rape, roots, maize, soya beans, tick beans, tares and peas. The experiments in connexion with development of poor lands are concerned chiefly with the improvement of the light sandy soils in the southern parts of the State and the clay lands in the Northern areas.



YANDILLA KING, 29.05 BUSHELS.



FEDERATION, 29.33 BUSHELS.

The owner of each seven-year experimental field of 10 acres has undertaken to conduct continuous experiments over that time. The agreement terminates this coming season. The seed and manure are provided free by the Department whose Field Officers sow the crops and supervise the harvesting operations. The fields containing 10 acres are divided into four separate sections known as:—

A. Not subsoiled.
B. Subsoiled.
C. Wheat and Oat varieties.
D. Fodder crops.

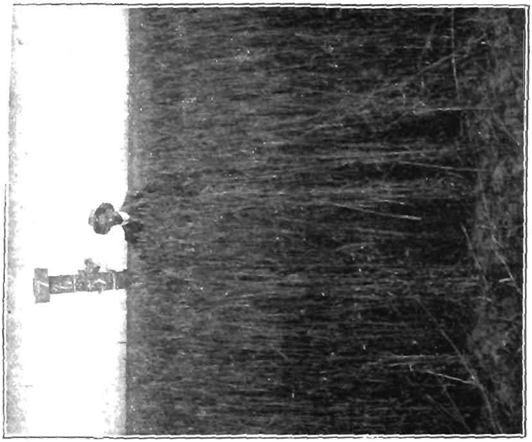
The manurial dressings on A and B are similar, the object being to ascertain if subsoiling will produce an increased yield sufficient to justify the extra cost of deeper cultivation. The farmer conducting the experiments receives a cash payment of £15 per year and two-thirds of the resultant crop, besides having the right to graze the area which has been securely fenced by the Department. This grazing right is of value during certain years, such as when rape is grown on the stubble in the rotation which serves the double purpose of fertilizing the land and providing succulent food for lamb-raising.

PLAN OF 7-YEAR FIELDS FOR SEASON 1910-11.

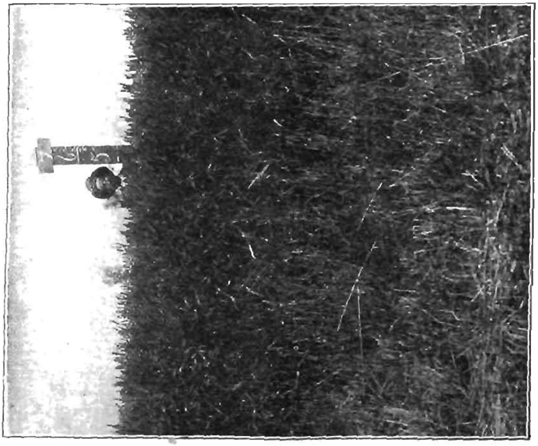
(*10 acres, including spaces between varieties.*)

Manured with ½ cwt. of superphosphate per acre.
Sown at the rate of 50 lbs. of seed per acre.

A.	3-10ths Acre.	Not Subsoiled.	Bunyip.
			Comeback.
			Federation.
			Yandilla King.
			College Purple Straw.
B.	1 Acre.	Subsoiled.	Bunyip.
			Comeback.
			Federation.
			Yandilla King.
			College Purple Straw.
C.	2½ Acres.	—	Fallow.
D.	1 Acre.	Variety Test.	Algerian Oats.
			Bonanza Oats.
			Tasmanian Giant Oats.
			Garton's Stout White Oats.
			New Zealand Black Oats.
			Pedigree World's Champion Barley.
			English Chevalier Barley.
			Western Wolth's Rye Grass.
	1 Acre.	Quantitative Test, Federation Wheat.	35 lbs. per acre.
			50 lbs. per acre.
			65 lbs. per acre.
			80 lbs. per acre.



COMEBACK, 21.8 BUSHELS.



COLLEGE PURPLE STRAW, 23.83 BUSHELS.

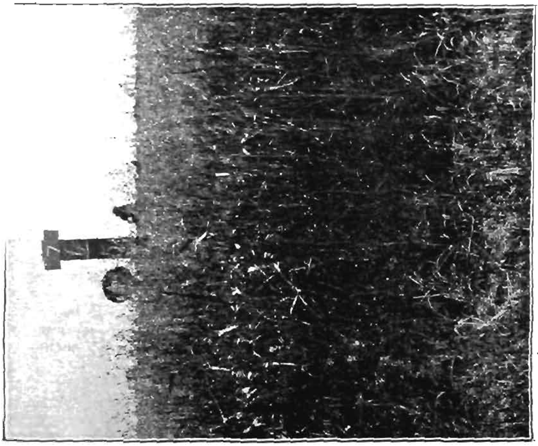
The crops throughout the Wimmera and Northern areas have been considerably interfered with by the abnormal growth of wild oats and poppies in the wheat plots, whilst the almost continual downfall of rain and cold snaps of severe weather had the effect of retarding the growth; on some farms the land became water-logged and greatly diminished the returns. In many instances, when the crop was just about ready for harvesting it was visited by a severe storm. In some cases the crops were laid flat on the ground or else 50 per cent. of the seed was shaken out. Every experimenter reports a backward season which has militated against good returns.

The returns to hand again show Federation wheat at the top. This wheat is now recognised as one of the best and most reliable varieties to grow in most districts of the State. It was bred by the late Mr. Farrer and is a cross between Fife and Indian wheats and this was crossed into Purple Straw. This wheat, even under the trying conditions experienced this season, has produced, on the average, 24.0 bushels per acre. One plot, on the farm of Mr. A. Boyd, of Minyip, returned as much as 44.60 bushels per acre.

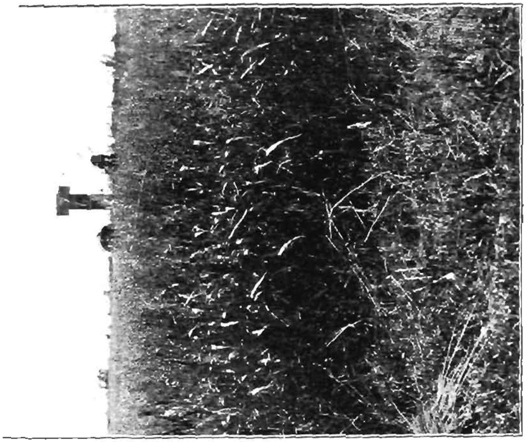
The introduction of new varieties would not be of any great value, if it were not coupled with the adoption of improved methods of cultivation, the intelligent use of artificial fertilizers, and the grading and pickling of the seed wheat. The wheat yield for the State for a period extending over the past eight years is only about 9½ bushels per acre and the Field Branch recognises that the average is open to vast improvement. Besides endeavouring to improve the yield there are other important considerations which demand, and are receiving, attention, such as the breeding or introducing of better milling wheats, or varieties which will withstand rust and other besetting influences. To this end, the Branch has set about to conduct wheat variety and manurial experimental tests in all parts of the State. Some classes of wheat adapt themselves by reason of their characteristics of early ripening and growth of straw, to certain localities. The establishment of these experimental plots gives the farmer an opportunity of finding out for himself which of the new or improved varieties are likely to become of value in his particular district. The advantage to the farmer of these systematic trials of wheat varieties cannot be over-estimated and one of the main objects of the Field Branch is to gather reliable data relating to the habits and yielding capabilities of all cereals grown on the plots.

Whilst the Branch is only too anxious to help the farmer, the latter must be patient and recognise that everything cannot be done at once. Some time must necessarily take place in the experimental work before it can be definitely stated which particular varieties of wheat are best adapted to each district. We do not wish farmers to act rashly and go in for new varieties extensively until these varieties have proved themselves worthy of special attention.

At present it is upon the wheat industry that the Northern parts of the State chiefly depend and it is the object of this Department to encourage the introduction of better methods of culture and the growing of pure seed for the purpose of improving the wheat yield. Fluctuations in returns are very often due to the use of inferior ungraded seed, improper manure, and lack of knowledge on the part of many farmers in relation to their soil conditions. No doubt, the majority strive to grow a variety that will return them quantity, but it is essential that quality



GARTON'S STOUT WHITE OATS, 46.7 BUSHELS.

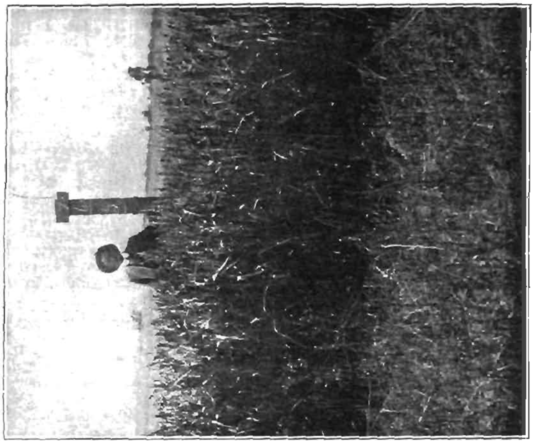


TASMANIAN GIANT OATS, 45.5 BUSHELS.

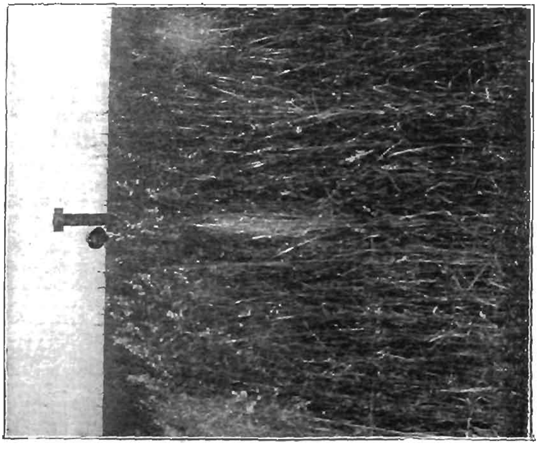
should be also taken into consideration. The time has arrived when more attention will have to be devoted to the milling qualities of the wheats grown in Victoria, and I have urged the necessity of securing a milling plant for the purpose of testing all wheats grown on the experimental plots. Approximately, 50 bushels of wheat are required to make 1 ton of flour representing 68 per cent. flour, 7.5 per cent. pollard, 21.2 per cent. bran, and 3.3 per cent. waste.

It is a great disadvantage to wheat farmers that there are no facilities for determining the milling qualities of the different varieties of wheat. This is to be remedied to a certain extent by the installation of a milling plant at the Dookie Agricultural College under the expert superintendence of the Principal, Mr. Hugh Pye. The advantages of knowing the milling properties of the various varieties may readily be understood if one considers an every-day case of two adjoining wheat-farmers, one growing Federation and the other Dart's Imperial. With 200 lbs. of flour obtained from Federation wheat it is estimated that 293 lbs. of bread are produced, whilst in the case of Dart's Imperial 285 lbs. only are produced from the same quantity of flour. Under the conditions which at present govern the sale of wheat, the second man generally receives the same price per bushel as the first man, instead of about 3d. per bushel less—if wheat were paid for on a gluten content basis. To illustrate the position more clearly, suppose both the wheats under review yielded the same number of bushels per acre (say 30 bushels). This would mean an additional profit of 7s. 6d. per acre to the farmer growing Federation; but besides there is the increased yield to be considered; for instance, during the season 1908-9 in 26 wheat-fields throughout the State, Federation gave an average yield of 18.3 bushels per acre as against 14.9 bushels for Dart's Imperial. Add this yield to the profit already stated above and it gives to the farmer growing Federation wheat an increase of over 19s. per acre (reckoning wheat at 3s. 6d. per bushel), a very important consideration to the large wheat-grower with thousands of acres under cultivation.

At present, the wheat industry is run on the same unsatisfactory basis that existed throughout Victoria in regard to the dairying industry before the introduction of the Babcock tester some years ago. The dairyman's object was to breed a class of dairy cow yielding large quantities of milk irrespective of its quality. To-day, the wheat-grower's object is to grow a variety of wheat which will return him the greatest number of bushels irrespective of its gluten value. A great deal of the trouble lies in the fact that most of our wheat is exported whole instead of being converted into flour locally and then exported. Under the present system, also, the by-products, such as bran, 21.2 per cent. of the whole, and pollard 7.5 per cent., are sold in other countries competing against us in the dairying industry, such as Denmark, where they can be purchased at cheaper rates than in Victoria. These countries are thereby assisted to compete against Victorian producers and at the same time our soil fertility is impoverished. If the wheat were ground into flour in Victoria the whole of the wheat-bran, which contains a large percentage of phosphates, could be profitably fed to our dairy herds at a reduced cost. This would assist to maintain the soil fertility and at the same time be a great boon to all classes of dairymen and stock-breeders. Cheap pollard by this means would also mean a large increase in the raising and fattening of pigs. It has been estimated that the fertilizing value of bran and



NEW ZEALAND BLACK OATS, 25·9 BUSHELS.



ALGERIAN OATS, 35·5 BUSHELS.

pollard, after being fed to animals, is worth £3 per ton and when used as such would be the means of saving thousands of pounds now annually expended in the purchase of artificial manures.

The area and varieties of wheat and oats sown in each 7-year field are shown on page 139. The photographs on pages 138 to 146 of the plots on the farm of Mr. D. B. Innes, of Rainbow, give a very good idea as to the uniformity of this particular field. The average yield per acre from the whole of the fields shows Federation, College Purple Straw, and Yandilla King to be the most satisfactory varieties and clearly demonstrates the advisability of wheat-growers giving these varieties more attention in the future. The highest yield per acre for all the varieties was obtained on the farm of Mr. A. Boyd, Minyip. The following are his returns :—

Federation	44.60	bushels per acre.
Yandilla King	38.73	,, ,,
College Purple Straw	38.44	,, ,,
Comeback	34.83	,, ,,
Bunyip	36.13	,, ,,

or an average for the whole field of 38.54 bushels per acre, or a clear profit of £5 1s. 9d. per acre, as can be easily seen by the following table :—

Cost of putting in one acre.

	£	s.	d.
Preparation of land	0	8	6
Manure (56 lbs. at 5s. per cwt.)	0	2	6
Seed wheat (50 lbs. at 3s. 7d. per bushel)	0	3	0
Drilling	0	1	6
	0	15	6

Cost of taking off one acre.

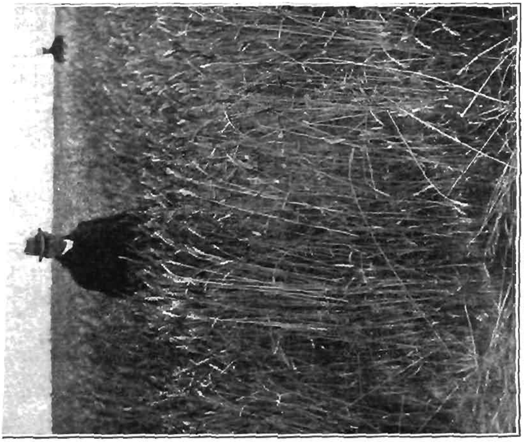
	£	s.	d.
Harvesting	0	8	0
Bags	0	6	6
Carting	0	6	6
	1	1	0
Plus cost of putting in	0	15	6
	1	16	6

Value of grain.

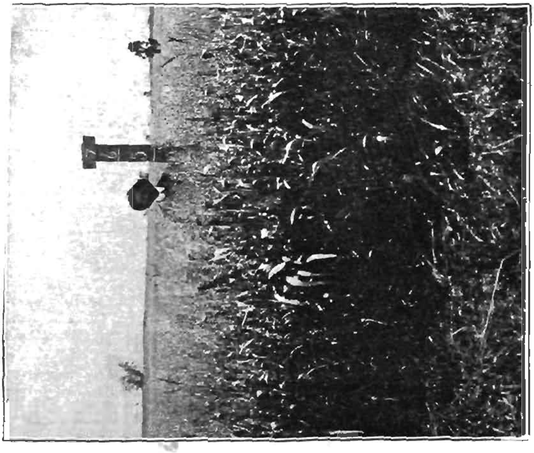
	£	s.	d.
38.54 bushels at 3s. 7d. per bushel	6	18	3
Less cost of production	1	16	6
Net profit per acre	5	1	9

The crops of Cleveland, Californian, Blue Stem, and Rural New Yorker No. 6, illustrated on pages 146-150, were grown in the Ballan district; Cleveland by Mr. J. Dickens and the others by Mr. J. T. Topper. It is intended to experiment with these varieties in the Northern areas next season.

The continuous use of superphosphate is beginning to cause thoughtful farmers to consider whether, without the aid of some other manure or system of keeping the land in good heart, it will not eventually result in injury to the wheat-growing districts. The continuous drain of phosphates taken from the wheat areas by cereal cropping must be returned in some



CLEVELAND WHEAT CROP AT BALLAN.



BONANZA OATS, 23 BUSHELS.

suitable form to equalize matters or the land will suffer. Analyses made by the Chemist for Agriculture show that, even in the richest soils in Victoria, the proportion of phosphoric acid rarely exceeds 0.1 per cent., or less than 2½ lbs. weight in every ton of soil. The situation is therefore serious when one takes into consideration the small percentage of this essential plant food that is available. Observant farmers have noticed that the continuous use of superphosphate, without the application of a corrective such as lime, eventually brings about acidity of the soil. The prolific growth of sorrel is evidence of the fact that some sweetening factor is necessary.

To grow wheat successfully and profitably the farmer must plan ahead. I consider a thoroughly pulverized, well packed seed-bed of more importance than the application of artificial manures. This can only be accomplished when the soil is ploughed properly, that is, deeply and uniformly. Discing the ground when it is in just the right condition will prevent it from getting hard. There are two advantages. First, it pulverizes the soil in the bottom of the furrow, making good that part of the seed-bed which is most difficult to reach if one waits till after ploughing. Secondly, a large area can be disced much more quickly than ploughed and will become mellow in a shorter time. A good seed-bed can best be obtained by ploughing early and working thoroughly. The ground that is ploughed each day should be followed by the harrow and worked down to a fine tilth. More lumps can be pulverized in one hour when in the right condition, than in three when the sods become hard and dry. In dry weather it is very important to attend to this mellowing.

WHEAT RETURNS, SEASON 1910-11.

(*Yield per acre in bushels.*)

Name.	Address.	Federation.	College Purple Straw.	Yandilla King.	Comeback.	Bunyip.	Average of all Varieties.
Wimmera—							
Boyd, A.	Minyip ..	44·60	38·44	38·73	34·83	36·13	38·54
Gibbins, E.	Garup ..	34·30	24·20	26·00	21·06	6·20	22·35
Longerenong Agricultural College	Dooen ..	36·46	28·05	22·50	27·00	19·04	26·61
Nash, H.	Jung ..	24·85	17·35	22·40	11·60	8·60	16·96
Average of 4 fields ..	.. ..	35·00	27·01	27·40	23·62	17·49	26·11
Northern and North-Eastern—							
Carter, J.	Marong ..	28·66	24·38	20·27	15·72	7·22	19·25
Sharp, T. R.	Goorambat ..	24·40	21·32	22·28	12·00	11·20	18·24
Average of 2 fields ..	.. ..	26·53	22·85	21·27	13·86	9·21	18·74
Mallee and Mallee Fringe—							
Innes, D. B.	Rainbow ..	29·33	23·88	29·05	21·80	8·46	22·50
Lavery, B.	Watchem ..	20·44	22·73	25·66	20·38	9·93	21·62
McNaughton, J. .	Narraport ..	7·86	8·93	5·83	6·53	2·46	6·32
Pilgrim, J.	Nhill ..	8·44	8·10	5·33	5·52	4·16	6·31
Williamson, W. ..	Boort ..	8·53	11·93	8·77	8·20	6·88	8·86
Witney, J.	Jeparit ..	11·27	11·83	11·04	8·88	10·06	10·80
Average of 6 fields ..	.. ..	15·81	14·56	14·43	11·88	6·97	12·73
Average for all fields ..	.. ..	25·79	21·47	21·03	16·45	11·22	19·22

RETURNS OF SEED TEST PLOTS, SEASON 1910-11.

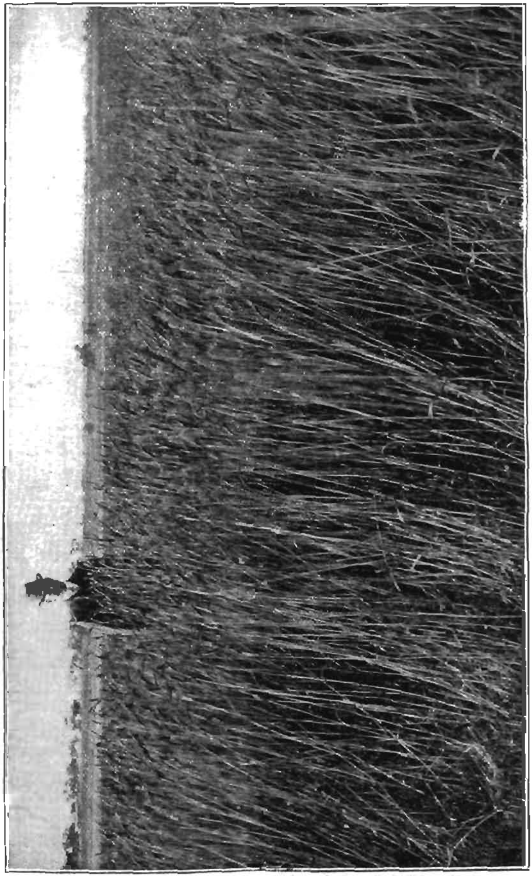
(Yield per acre in bushels.)

Name.	Address.	Seed Sown per Acre.			
		35 lbs.	50 lbs.	65 lbs.	80 lbs.
Wimmera—					
Boyd, A. ..	Minyip ..		Cut for	hay	
Gibbins, E. ..	Garup ..	27·00	26·93	30·93	30·53
Longerenong Agricultural College ..	Dooen ..	22·75	25·36	27·63	21·16
Nash, H. ..	Jung ..	22·33	19·23	19·93	18·93
Average of 3 fields ..	..	24·03	23·84	26·16	23·54
Northern and North-Eastern—					
Carter, J. ..	Marong ..	12·55	13·46	17·76	14·23
Sharp, T. R. ..	Goorambat ..	14·88	26·32	30·16	16·12
Average of 2 fields ..	..	13·71	19·89	23·96	15·17
Mallee and Mallee Fringe—					
Innes, D. B. ..	Rainbow ..		Cut for	hay	
Lavery, B. ..	Watchem ..	12·30	9·16	13·20	13·33
McNaughton, J. ..	Narraport ..	4·33	3·73	5·20	7·70
Pilgrim, J. ..	Nhill ..	10·52	13·22	13·46	14·22
Williamson, W. ..	Boort ..	7·80	6·80	6·13	9·46
Witney, J. ..	Jeparit ..		Cut for	hay	
Average of 4 fields ..	..	8·73	8·23	9·50	11·18
Average for all fields ..	..	15·49	17·32	19·87	16·63

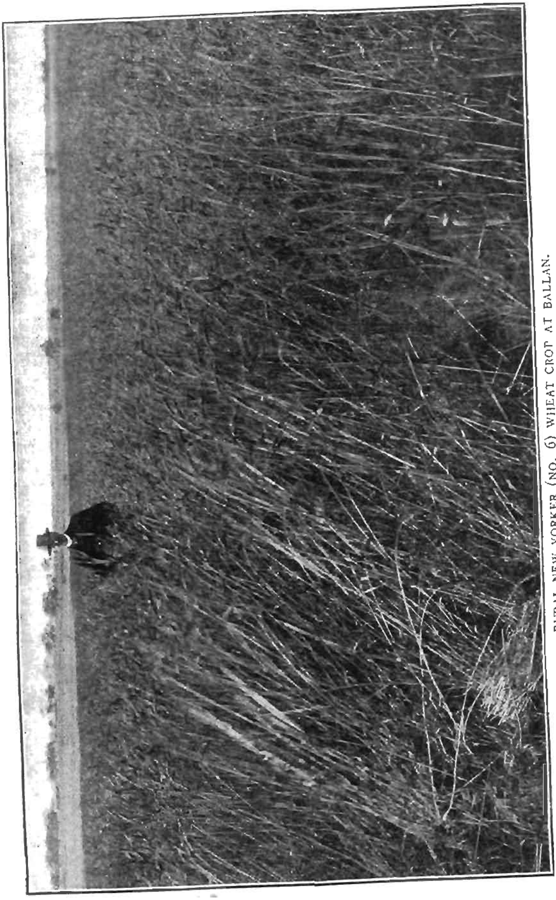
OAT RETURNS, SEASON 1910-11.

(Yield per acre in bushels.)

Name.	Address.	Algerian.	Tasmanian Giant.	Bonanza.	Garton's Stout White.	New Zealand Black.	Average of all Varieties.
North and North-Eastern—							
Carter, J. ..	Marong ..	23·20	23·10	20·40	32·50	8·53	21·54
Sharp T. R. ..	Goorambat ..	48·80	48·80	33·96	49·44	25·28	41·25
Average of 2 fields ..	..	36·00	35·95	27·18	40·97	16·90	31·39
Wimmera—							
Boyd, A. ..	Minyip ..	45·00	37·50	37·90	29·00	28·40	35·56
Nash, H. ..	Jung ..	33·90	29·90	28·15	24·00	21·55	27·50
Longerenong Agricultural College ..	Dooen ..	24·05	20·25	20·21	9·40	11·50	17·26
Average of 3 fields ..	..	34·61	29·21	28·75	20·80	20·48	26·77
Mallee and Mallee Fringe—							
Innes, D. B. ..	Rainbow ..	35·50	45·50	23·00	46·70	25·90	35·32
Lavery, B. ..	Watchem ..	25·90	34·30	33·10	33·40	36·70	32·68
McNaughton, J. ..	Narraport ..	21·50	10·50	21·10	23·80	22·40	19·86
Pilgrim, J. ..	Nhill ..	23·80	13·20	9·40	10·36	9·00	13·15
Williamson, W. ..	Boort ..	23·92	29·52	21·44	26·25	22·48	24·72
Average of 5 fields ..	..	26·12	26·60	21·60	28·10	23·29	25·14
Average for all fields ..	..	32·24	30·58	25·84	33·29	20·22	27·76



CALIFORNIAN BLUE STEM WHEAT CROP AT BALLAN



RURAL NEW YORKER (NO. 6) WHEAT CROP AT BALLAN.

SUMMARY OF RETURNS.

Throughout the State the Federation variety of wheat still takes first place as a grain yielder with the splendid average of 24.13 bushels per acre. This variety is followed by College Purple Straw, 21.47 bushels, and Yandilla King with 21.03 bushels.

The average yield for all varieties is 19.22 bushels per acre as compared with 18.40 bushels per acre on the same fields last year and 14.62 bushels for the preceding year.

In the seed test plots, where Federation wheat was sown in varying quantities per acre, the 65 lbs. per acre gave the best general average, namely 19.87 bushels per acre, but in the Mallee districts the 80 lbs. per acre gave the best results by 1.60 bushels per acre.

Among the oats, Garton's Stout White stands out first with 33.29 bushels per acre and at Gooramhat gave the splendid yield of 49.44 bushels. This variety is closely followed by Algerian with an average of 32.24 bushels, whilst Tasmanian Giant takes third place with 30.58 bushels per acre. These particular varieties of oats, together with Western Wolth's Rye grass, were introduced into the plots for the purpose of demonstrating that suitable fodder plants can be profitably grown in the Northern areas as a stand-by for live stock grazed on the farm.

II. EXPERIMENTAL WORK AT LONGERENONG AGRICULTURAL COLLEGE.

J. T. Pridham, Wheat Experimentalist.

Of the 50 acres of the College land set apart for the use of the Department nearly 5 acres were devoted to hand-sown plots. These were sown in drills 1 foot apart and single seeds were dropped at every 6 inches in the rows. This is a slow method, but it has the following advantages:—(1) a small quantity of seed will go a long way, (2) each individual plant can readily be distinguished from its fellows (and this is very important in wheat breeding and improvement), (3) hoeing and weeding are facilitated.

WHEAT.

Crosses made.—There were nineteen crosses made which gave a very satisfactory percentage of grain on the average. In this work, the aim has been to secure a prolific variety which shall also have grain of satisfactory milling quality. Although we have no testing mill, advantage has been taken, when choosing parents for a cross, of the milling analyses of varieties already published.

Three crosses were made on oats.

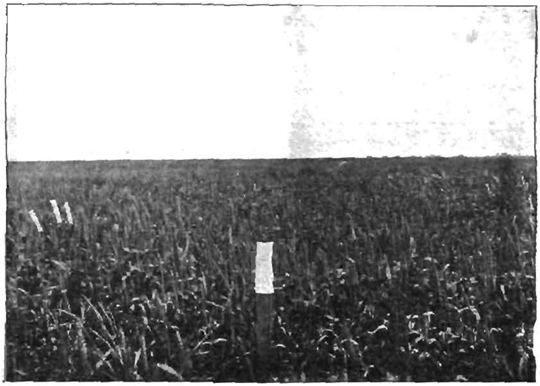
Seed harvested from crosses made in 1909.—There are 92 crossbreds in this section, of which seed has been saved. The most promising of these are crosses between prolific English varieties; also heavy yielding purple straw wheats with Indians and Fife-Indians. The requirements of the Wimmera district are that a variety shall (1) stand up well against heavy winds, (2) hold its grain well, (3) ripen early, but not too early. Some of these crossbreds appear likely to be very satisfactory in these respects, others will need further crossing to improve them.

Crossbred seed of third generation (crosses made in 1908).—In planting these, 71 per cent. were rejected as unsuitable and of the nineteen crossbreds of which seed was planted eight were thrown out at harvest time as unprolific or liable to shake out their grain.

Seed of the fourth generation.—Some crossbreds from the late W. Farrer's collection were sown and of these the most promising is a Fife-Indian wheat (366/S) which should be persevered with.

Imported Indian varieties.—Over 90 samples were received through the Agent-General from various parts of India and sown last season. They had a short slender straw for the most part and held their grain well. Many of them were of the macaroni wheat type with strong awns which are objectionable in harvesting. However, a few of the beardless types are likely to prove useful, especially Nandero No. 6, which has a brown, dense head with attractive looking, white, rather translucent grain.

Samples of varieties imported by Senator McColl.—These were sown and compared with Federation which is our best wheat at present. These varieties are too late maturing for the most part for our conditions, though Chul is an exception. Two crosses were made on this wheat which



BREEDING PLOTS AT LONGERENONG, CROSSED HEADS SHOWING.

appear to be prolific and hardy though its awns are an objection. It is earlier than Dart's Imperial, but not so early as Federation.

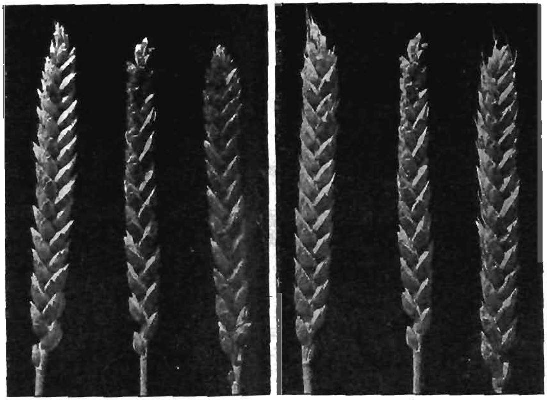
Wheats other than crossbreds.—One or two selections from Australian Talavera yield well, hold their grain, and have straw of satisfactory strength. World's Wonder, probably the same as Baroota Wonder, seems a prolific wheat and yields better than Dart's Imperial. Its flour strength, however, is not likely to be superior to that of the latter variety. A few selections from Purple Straw, received from Mr. P. Pilgrim, of Nhill, proved to be too liable to shake. The windy harvest season has thoroughly tested the capabilities of the wheats grown to hold their grain. A number of varieties from Federation were planted. These all came true to type; some club headed and some with short awns, but all having the brown coloured ears and type of grain characteristic of that variety though some samples of grain were larger than others. None of the varieties appeared to be more prolific than the strain now grown by us. These from their

constancy would appear to be "mutations"; although Federation may be considered a fixed variety, slight variations may be expected to appear from time to time, but these are not sufficiently marked to render the grain impure for sale as seed wheat.

Firbank is an extremely early hay wheat, does not grow much flag and is green to the foot. For beating the wild oats on a dirty fallow it would be useful but is not a prolific grain yielder. Bayah is a variety received from New South Wales and has a brown ear, but the straw is taller than Federation. It holds its grain satisfactorily and is likely to prove an acquisition.

Wallace is a heavy yielder but in this district suffers, though to a less extent than College Purple Straw, from windy weather at harvest time.

Best wheats to grow.—The varieties recommended by the Wheat Committee are Federation, College Purple Straw, Bunyip, Comeback and



1. 2. 3. 4. 5. 6.

CROSSBREDS OF THIRD GENERATION COMPARED WITH FEDERATION.

1 and 3, Yandilla King; 2 and 5, Federation; 4 and 6, Pratt's Comeback Wallace.

Yandilla King. The heads of College Purple Straw snap off easily in windy weather at harvest time. Bayah might be substituted for this wheat when sufficient grain is available for sale.

Field crops.—If these had been sown later, after an extra cultivation, the yield would have been better as the fallow turned out to be very weedy. But the hand sowing was considered to be more important work and was pushed on with as soon as possible after drilling in the field areas. It would be better to restrict our operations to the stud or hand-sown plots in future and arrange for the College to raise bulks of seed on a larger area for distribution, thus enabling us to confine our attention to the breeding and improvement work. The Department has a quantity of Federation, Bunyip, Yandilla King and Comeback seed wheats grown on

the stud plots this season, which are called "stud bulks", descended in each case from selected plants harvested in 1908.

Of the varieties now available in bulk, only the Bunyip and Comeback are grown from selected seed but next year the whole 50-acre area may be sown with such seed, except in the case of Bayah which is a newly introduced variety from New South Wales.

Oats.

The season was a favourable one for oats; even the late varieties suited to the cooler districts, which usually yield pinched grain here, produced a plump sample. Algerian oats suit the local conditions best and are almost exclusively grown. The accompanying table, however, shows that two new crossbred varieties have done quite as well or better than Algerian and as they ripen about the same time they are likely to be very useful oats for the district.

OATS—RESULTS OF EXPERIMENTAL PLOTS.

Row.	Variety.	Sown.	Began to Head.	Ripe.	No. of Plants Harvested.	Average Yield per Plant in drams.	Remarks.
72B	Amarilla	May 3	Oct. 22	Dec. 6	6	7·1	
73	.. ..	..	..	..	6	8·0	
74	Algerian x*	..	Oct. 25	Dec. 8	4	6·8	
87	No. 136	..	Nov. 2	..	6	4·8	
88	.. ..	..	Nov. 1	..	6	5·6	
89	Algerian*	..	Oct. 26	..	6	5·1	
90	No. 136	..	Nov. 2	..	6	4·5	
122	White Ligowo x Algerian ..	May 4	Oct. 27	Dec. 12	4	7·8	
123	.. .. ..	..	Oct. 26	Dec. 8	6	7·5	
124	Algerian*	..	..	..	6	6·9	
125	White Ligowo x Algerian ..	..	Oct. 28	Dec. 12	6	8·8	
126	.. .. ..	..	Nov. 2	Dec. 21	6	6·1	
127	.. .. ..	..	Oct. 31	Dec. 12	4	5·1	
128	.. .. ..	..	Oct. 26	..	6	7·4	
129	Algerian*	..	..	Dec. 8	5	6·6	
130	White Ligowo x Algerian ..	..	..	Dec. 12	6	5·9	
131	.. .. ..	..	Rejected,	unprolific			
132	.. .. ..	..	Oct. 26	Dec. 12	6	6·0	
133	.. .. ..	..	Oct. 28	..	6	6·18	
134	Algerian*	May 6	Oct. 22	Dec. 8	6	8·91	
151	Algerian x White Tartarian ..	May 7	Oct. 25	Dec. 12	6	9·7	Total yield of row, 2 lbs. 10 ozs.
152	.. .. ..			Rejected			
153	.. .. ..			..			
154	Algerian*	..	..	..	..	..	Total yield of *row to compare* with 151, 2 lbs. 9½ ozs.
155	Agerian x White Tartarian ..	May 9	Nov. 1	Dec. 16	6	4·9	
156	.. .. ..	..	..	..	3	4·6	
157	.. .. ..	..	Nov. 2	..	6	5·1	
158	.. .. ..	..	..	..	5	5·2	
159	Algerian*	..	Oct. 31	Dec. 8	6	5·8	
160	White Ligowo x Algerian ..	..	Oct. 26	Dec. 12	6	5·3	
161	.. .. ..	..	..	..	5	6·4	
162	.. .. ..	..	..	..	5	6·9	
163	.. .. ..	..	..	..	6	7·3	
164	Algerian*	..	Oct. 28	..	6	5·5	

* *Best selected seed sown for comparison.*

In consequence of the uneven nature of the soil and the occurrence of diseased patches in the crop it was found best to harvest a few of the most prolific, early ripening plants and weigh the produce of these rather than the grain from the whole plot in order to make comparisons.

Algerian x White Tartarian, row 151, has the long narrow grain of the Tartarian, side-bearing oat with a long and open head and straw that is decidedly stronger than Algerian without being as coarse as that of Tartarian oats. It stools well and stands up against high winds.

White Ligowo x Algerian, row 125, has a fine straw like Algerian; so also has the strain of this cross planted in row 163, but it grows a little taller than Algerian. It will be a few seasons yet before sufficient seed can be obtained for distribution as the crossbreds though nearly fixed as to type are not quite ready to propagate in large plots. These have been favourably reported on at the Bathurst Government Farm in New South Wales this season, also oat No. 136 which did not yield so well with us as it did in 1909.

The Amarilla variety is almost identical with Algerian, though the straw has less of the pink colour identical of Algerian. The grain of the two oats can hardly be distinguished when compared, but the Amarilla appears to be the better yielder of the two. We have over 3 lbs. of the best strain of this oat which will sow ¼ acre when the seed is dropped singly by hand at distances of 6 inches in the rows. By planting in this way we are able to raise a large quantity of seed from a small sample of selected seed but this entails a considerable amount of hoeing and weeding as is required with the beet crop. We may have several strains of any variety but consider it wise to sow only the best yielder of these, even though the quality of seed available may be very small. By sowing as above described 10 lbs. will easily sow an acre.

THE INFLUENCE OF RADIO-ACTIVE MINERALS ON WHEAT.

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist of Victoria, and Professor of Botany and Plant Physiology in the Melbourne University; and Victor Nightingall, Government Research Scholar.

A good deal of work has been done recently in various parts of the world upon the influence of exposure to the action of Radium and Rontgen Rays upon plant life and growth. For the most part, however, the experiments, particularly with radium and radio-active minerals, have been performed on a small scale in the laboratory by merely exposing the plants for varying times and at varying distances, from the source of the radiation, without any attempt being made to discriminate between the action of the different rays or to determine the influence of direct contact with the radium emanation where the experiments are made with radium or radio-active minerals. Hence, it is not surprising that the results hitherto obtained by different investigators, both on the same and on different plants, are in many cases difficult to harmonize. It seemed, therefore, advisable to critically investigate certain of the phenomena already observed, particularly with a view to differentiate between the various actions which exposure to radium or radio-active minerals must necessarily involve, and the award of a Government Research Scholarship to Mr. Victor Nightingall, made it possible to commence a joint investigation into this question. The detailed scientific investigation is likely to require a considerable time for its completion, but certain general experiments carried out with wheat in the experimental plots at the University System Garden may

be communicated now, since they are complete for the past year, though not entirely conclusive.

It appears to have been generally concluded by different investigators, that prolonged exposure to any intense form of these radiations is injurious to the plant, and either retards its growth or ultimately kills it. It appears, however, to be a general rule in plant physiology that, in such cases, the same agency when applied in less intense or less concentrated form will cause an acceleration of growth, or will stimulate the general vigour of the plant, sometimes to a surprising degree. This peculiarity is very pronounced in the case of certain poisons, which when diluted below lethal concentration, may stimulate the growth of a plant to as great an extent as an addition of a food substance or of manure would do.

Bearing in mind the fact that exposure to radio-activity of low concentration appears in some cases to stimulate the growth of the plant, it appeared of interest to determine whether the addition of small quantities of radio-active minerals to the soil would sufficiently stimulate the growth of such plants as wheat, for example, to make their use profitable on an agricultural scale. Large deposits of radio-active rock have been found in Australia, and a large supply of finely ground and strongly radio-active rock was obtained from a particular locality. This was applied to different plots singly, as well as in conjunction with superphosphate, and finely ground phosphate rock. The plots were harvested at the end of November before the grain was fully ripe, so as to avoid possible loss by birds and falling grain.

The fact that all the plots were slightly attacked with the Corn Mildew (*Erysiphe graminis*) shows that the presence of a radio-active mineral in the soil affords no protection against the attacks of parasitic fungi.

Apart from the addition of the radio-active mineral and mineral manure, the plots received exactly the same treatment, and all consisted of the same soil of rather light loam with a clayey subsoil. The wheat was planted in equi-distant rows and the grains in each row at the same depth and distance. In plots 1, 2, 4, 5, 6, 7, 8, each seed received a separately measured dose of the mineral or manure after planting, and was then covered with soil. In plot 9 the mineral was drilled in, while, in plot 10, it was placed immediately under each seed. Plot 3 was a control plot to which no mineral or manure was added. The heads and straw were harvested separately by hand and weighed. The plots were not all exactly the same area, and the figures which follow beneath are estimated at the same area and number of plants.

Plot.	Amount Per Acre.	Heads.	Straw.
1	1 cwt. Radio-active Mineral	122	291
2	2 cwt. Radio-active Mineral	146	448
3	Control (none)	102	362
4	1 cwt. Phosphoric Rock	67	296
5	½ cwt. Phosphoric Rock and ¾ cwt. Radio-active Mineral	80	404
6	½ cwt. Superphosphate	100	337
7	¼ cwt. each Radio-active Mineral and Superphosphate	85	352
8	2 cwt. Radio-active Mineral	76	293
9	3½ cwt. Radio-active Mineral (drilled)	154	408
10	1 cwt. Radio-active Mineral immediately under seed	164	479

Without attaching too much importance to the results which are not entirely consistent, and would need to be repeated in two or three consecutive years to obtain complete certainty, the radio-active mineral does appear to affect the weight of both the straw and the heads to some extent when fairly heavy dressings are used. Thus, the average weight of the heads of all the plots treated with radio-active mineral in varying amounts and combinations, was 118, whereas from those to which none of it was added only a yield of 90 was obtained. The similar figures for the straw were 369 and 362 respectively.

It is certainly suggestive that plot 10, in which the radio-active mineral was placed immediately under the seed, gave, of all the plots, the biggest yield of both the heads and straw. On the other hand, one of the radio plots (No. 8) gave next to the poorest yield of both heads and straw, but the fact that this plot was smaller than any of the others, and that the mineral was placed over the seed instead of below it and close to it, may have something to do with the low yield. The lowest yield of grain would apparently be given by the plot treated with the finely-ground phosphate rock, and although the addition of the radio-active mineral apparently increased the yield of straw, it seems as though it would have only slightly, if at all, increased the yield of grain. In the same way, comparing plots 6 and 7, the addition of radio-active mineral to superphosphate, if anything, decreased the yield of grain.

It is evident, however, from the careful study of the results, that no conclusive results can as yet be drawn from them. They must be taken merely as an indication that experiments in this direction may ultimately yield interesting or even economically useful results, and that there is a possibility that the addition of finely divided radio-active minerals to the soil may influence the yield. Until, however, these experiments have been repeated several times on both a large and small scale, and the questions of relative yield and cost have been fully considered, it would not be advisable for any farmer to spend a penny in the purchase of such additions to the soil.

The Government Analyst (Mr. P. Rankin Scott) reports that the mineral in question contains the following :—

	Per cent.
Phosphoric acid P_2O_5	0·218
Potash K_2O	0·740
Calcium CaO	0·400
Magnesia MgO	2·14

It is evident, therefore, that neither the phosphoric acid, potash, calcium, nor the magnesia, are present in sufficient amount to explain the results observed, especially considering the fact that only a small part of these constituents would be immediately available for the plant's use. Any appreciable result produced by the addition of this mineral to the soil could therefore fairly be ascribed to the direct or indirect action of its radio-activity, but whether such results are constantly given in field trials is a matter for future determination.

NHILL FARM COMPETITIONS.

Judge: F. W. Sallmann, "Fine View," Kornheim.

I have much pleasure in forwarding my report and awards in connexion with the Farm Competition carried out under the auspices of your society, which deserves great credit for encouraging farmers by giving good prizes and carrying out all arrangements in a business-like manner. It would be a splendid thing for the farming community if other societies would act similarly. The result would be more and better managed farms in the State.

As to the system of cultivation and rotation I find that some of the farmers have adopted sowing oats after the stubble is burnt. Where a good crop of wheat has been harvested, there is no doubt that the best fallow is after a crop of oats has been taken off. You will then very seldom find Take-all. My own experience is that the best and most profitable results are obtained by fallowing land from which an oat crop has been taken off—either cut for hay, stripped, or left to feed off. The oats should be drilled in with about 30 lbs. of artificial manure per acre. The fertilizer makes the hay sweet, and the result is that the crop can be cut green. Every acre of wheat stubble should be burnt and then sown with oats which means taking off two crops from the same land in three years. I consider it better than if the land is out of cultivation for even 6 or 7 years. Less land is required to make a good living. I am certain this system put up the price of land at least £3 per acre in my district.

Nearly all the crops were "wild-oaty" and more or less affected with Take-all, whilst others watered out in lowlying patches, due, no doubt, to the exceedingly wet winter. The following are the results of the various competitions:—

Best Worked and Managed Farm of an Area 640 Acres and Over.

In deciding the merits of the respective farms in this competition and also that for farms under 640 acres, the following points (maximum 265) were taken into consideration:—

A. The best system of cropping, including, cultivation, methods, rotation, and manures, 25.
B. Cleanest and best crops, including oats, 20.
C. Fallow in best order, area considered, 20.
D. Best quality of working horses, 25.
E. Brood mares, 10.
F. Sheep, 20.
G. Cattle, pigs, and poultry, 5.
H. Implements and machinery, 20
I. Boundary fences, gates, sheep-yards, 15.
J. Orchard and vegetable garden, 10.
K. Water storage, dams, windmills, 45.
L. Dwellings and outbuildings, 30.
M. Fodder, 20.
N. Tree-planting, 5.
O. Insurance, 5.

Competitor.	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.	K.	L.	M.	N.	O.	Total.
O. Roediger ..	18	14	20	14	1	12	2	18	12	6	33	19	15	4	3	191
F. Borgelt ..	18	14	17	20	8	13	2	14	10	7	28	16	12	3	1	183
G. Batson ..	20	13	17	18	5	14	5	14	11	7	30	18	12	1	4	189
W. Sanders ..	18	18	17	18	8	15	3	13	12	9	30	15	6	1	2	185
G. Crouch.. ..	20	16	17	20	8	14	1	16	12	1	28	16	5	1	3	178

First.—O. H. Roediger .. .. 191 points.
Second.—G. Baton .. .. .. 189 ,,
Third.—W. Sanders .. .. .. 185 ,,

Mr. Sanders lost points on reserve fodder but can be complimented on his very clean crop. Mr Crouch lost points on orchard and garden.

Mr. Roediger has three windmills and supplies water in pipes a good distance to paddocks. His beautiful flower garden and hot houses deserve special mention.

Mr. Batson lost most points through his crop being too wet—the paddocks he had put in this year were lowlying land. Mr. Batson must, however, be complimented on his experimental plot; he goes to a great deal of trouble in planting different varieties of wheat, oats, and barley. Nearly all are new to the Wimmera in which they seem to thrive. Mr. Batson has also a splendid kitchen garden. Altogether, this is a very compact farm.

Messrs. Borgelt and Crouch have each got some good horses and brood mares. Both of the farms are good; in fact, on the whole, the five farms are a credit to the district.

A good experiment in sowing wheat was shown by Mr. Roediger. He knocked out a few bags with a stick and sowed the grain at the same time and with the same manure, alongside the ordinary seed. The difference in the yield was about 8 bushels per acre. It shows how the seed suffers with stripping.

On Mr. Batson's farm I noticed a good implement in a spike roller. This is, in my opinion, one of the best to work rough fallow.

BEST WORKED AND MANAGED FARM OVER 100 ACRES AND NOT EXCEEDING 640 ACRES.

Competitor.	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.	K.	L.	M.	N.	O.	Total.
J. Diprose ..	*14*	*14*	*14*	*12*	*2*	*10*	*3*	*9*	*12*	*10*	*30*	*10*	*13*	*0*	*0*	*153*
R. G. Keams ..	13	13	13	13	5	11	3	11	10	8	25	10	13	2	1	151
H. Dahlenburg ..	*14*	*13*	*14*	*16*	*5*	*9*	*4*	*16*	*15*	*6*	*34*	*20*	*12*	*2*	*0*	*180*
J. Dickinson ..	13	13	14	10	0	10	1	9	6	1	20	5	10	0	2	114

First.—H. Dahlenburg .. .. .. 180 points.
Second.—J. Diprose .. .. .. 153 „
Third.—R. G. Keams .. .. .. 151 „

Mr. Dahlenburg can be complimented on his outbuildings, fencing, and stock. Mr. Diprose possesses a very compact farm. Mr. Keams, who has been on the farm only a few years, deserves credit for the improvements he has made, whilst Mr. Dickinson, a young beginner, is a very energetic man. It gave me pleasure to see a young man of his stamp come forward.

BEST HALF OF A FARMER'S WHEAT CROP ON FALLOWED LAND. (NOT LESS THAN 100 ACRES.)

Copetitor.	Cleanness and Evenness.	Trueness to Type.	Freedom from Disease.	Least Undergrowth.	Yield.	Total. *Maximum.* 65.
A. P. Koop ..	5	6	5	5	3[illegible]	60
A. McIntosh ..	5	4	5	5	28	48
T. Ervine ..	3	5	[illegible]	3	28	47
C. Roberts ..	6	5	5	6	28	50
W. Greenwood ..	5	5	6	5	36	57
W. E. Huf ..	5	5	5	4	28	45
R. Ward ..	5	5	5	4	31	50
G. Batson ..	5	5	6	5	18	39
G. Crouch ..	5	6	6	4	31	52

First.—A. P. Koop .. .. .. 60 points (Federation and Dart's Imperial).
Second.—G. Greenwood .. .. 57 „ (Federation and Yandilla King).
Third.—G. Crouch .. .. .. 52 „

Mr. Crouch has one of the best crops I have seen, but there are too many patches watered out. Mr. M'Intosh exhibited a very rare crop grown on Mallee land for which he deserves great credit. In the crops of Messrs. Ervine and Batson the yield was low on account of the excessive moisture.

BEST 100 ACRES OF GROWING CROP ON MALLEE LAND.

Competitor.	Cleanness and Evenness.	Trueness to Type.	Freedom from Disease.	Least Under-growth.	Yield.	Total. Maximum, 50.
J. B Marshall ..	4	5	6	4	24	43
Mrs. M. M. McKenzie ..	4	4	6	5	30	49
D. R. McKenzie..	3	4	5	4	23	39
L. R. Simmons ..	5	5	6	6	13	35
F. W. Reichelt ..	6	5	5	6	12	35

First.—Mrs. M. M. McKenzie .. .. 49 points (Federation).
Second.—J. B. Marshall .. .. 43 „ (Federation and Dart's Imperial).

The land of the successful competitors consists of heavy Mallee, whereas that of Messrs Simmons and Reichelt is more of a sandy nature right in the centre of the Mallee. I think that the Society should make a separate class so as to give farmers in the centre of the Mallee a chance. Messrs. Simmons and Reichelt deserve great credit for their clean crops and the way in which the land had been worked.

BEST FALLOWED LAND, NOT LESS THAN 100 ACRES.

Competitor.	Best Ploughed.	Least Weeds.	Least Dry Weeds, Late Worked.	Least Lumps.	Total. Maximum, 24.
J. Diprose	5	4	4	4	17
D. R. McKenzie	4	3	4	4	15
H. A. Dahlenburg	4	5	4	5	18
A. Dahlenburg	5	6	6	6	23
G. Batson	5	6	3	5	19
G. Crouch	5	5	5	6	21
W. E. Hut	5	5	5	5	20

First.—A. Dahlenburg .. .. .. 23 points.
Second.—G. Crouch .. .. .. 21 „

On account of the wet winter a large area of the fallow was worked too late. Farmers could not get on the land to work it before the weeds got large.

I think that your society should not allow a man to include part out of three paddocks in 100 acres of best wheat. Supposing a man has three paddocks of 100 acres each, he should enter one full paddock and part of the second, if he is required to show 150 acres.

I would suggest that points be given for the least noxious weeds. Orchards and vines should, I think, be separated from vegetable garden. Separate points should also be allotted for the best wool-shed and sheep yards. The size of the farm should be taken into consideration. If that were done it would be more just to the owner and simplify matters considerably for the judge.

In conclusion, it gave me great pleasure to see your district, and come in contact with good farmers. I picked up a good many points. Messrs. Young Bros. and Mr. Gladigau very kindly loaned their motor cars, otherwise the judging could not have been done under ten or twelve days. To them and also to your society and your energetic secretary, Mr. Towns, I desire to offer my sincerest thanks for the valuable assistance rendered.

MANCHESTER: A MARKET FOR AUSTRALIAN PRODUCE.

R. V. Billis, State Immigration Officer, London.

The necessity of securing promptly every new market, which may present itself, for the sale of Australian produce is as apparent as that of attracting more settlers for our lands. The work of the Victorian Government's Land Settlement Delegation has already resulted in a most valuable increase in the State's rural population and a steady and expanding stream of settlers from Great Britain to Victoria is now assured. An enormous increase in production may therefore be expected, and no question is more vital to the interests of the producing community than that the best and most convenient markets be secured for our goods.

A close study of the existing market conditions in Great Britain for Australian produce reveals many important facts. The following are perhaps the most striking:—

1. The keen endeavours of other countries to cater for the exact requirements of British buyers.
2. That, under present conditions, the Victorian producer does not receive such satisfactory returns as he might.
3. That one of the most attractive markets in Great Britain is, so far, comparatively unexploited by Victoria, or any other Australian State.

It is, however, concerning the third observation that this report deals. The undeveloped market includes the densely populated counties of Lancashire and Yorkshire, and indeed the whole of the West of England, and the Midlands, also portions of Scotland, while the chief receiving and distributing centre for these parts should be Manchester. Undoubtedly a large portion of frozen meat, fresh fruit, and rabbits from Australia reaches Manchester and from there is distributed among the consumers of the West and North, but such produce comes either *viâ* London or Liverpool and is subject to many handlings and to much unnecessary expense.

The consuming population in the immediate vicinity of the Manchester Ship Canal is over 2,000,000. Within a radius of 75 miles, containing 177 important towns, there is a population of 12½ millions, and the Manchester docks are nearer than any other port to every one of these towns. Furthermore, it is the practice of buyers from more distant towns to visit the Manchester markets regularly, so that this city is in reality the mart or trading centre for an enormous population. Here is a community numbering quite twice the population of Australia and New Zealand, and it is a community possessing unusual purchasing capacity, still it cannot boast—or Australia cannot boast—a direct steamship service to it.

THE SHIP CANAL.

The Manchester Ship Canal is too well known to necessitate a description here, and moreover, a description of this superb work by any one but a harbour engineer could not be adequate; but the following facts might be briefly stated, as they may be of general interest:—

The canal and docks cost £16,796,925.

The Ship Canal is 35½ miles in length. From the Barton Aqueduct to the Manchester Docks the bottom width is 170 feet and the depth of the canal throughout, and at the Docks, is 28 feet.

The Manchester Dock estate covers an area of 406½ acres, of which 160 acres are water space.

The quays are 6½ miles in length and cover 286½ acres, while a further space of 120 acres is available for their extension.

The quay equipment is most complete and includes :—

- 53 Hydraulic cranes.
- 61 Steam cranes.
- 91 Electric cranes.
- 47 Locomotives.
- 6 Floating pontoons.
- Pontoon shears capable of lifting 250 tons.
- 13 Single floor transit sheds.
- 1 Two floor transit shed.
- 6 Three floor transit sheds.
- 5 Four floor transit sheds.
- 12 Five floor transit sheds.
- 13 Seven storey warehouses.
- 4 Single floor warehouses.

The Dock railways are 80 miles in extent and connect with the following railway systems :—

- London and North-Western Railway.
- Great Northern Railway.
- Midland Railway.
- Great Central Railway.
- Lancashire and Yorkshire Railway.
- Cheshire Railway.

There is a grain elevator with a storage capacity of 40,000 tons, or 1,500,000 bushels, in 268 separate bins.

The No. 9 Dock, now occupying a site which five years ago was the Manchester Race-course, is said to be the largest dock in the Kingdom, and probably in the world. Two lines of rails run along the quays, and at this dock perishable cargo is discharged under cover.

The Manchester Ship Canal Company, which is in reality a Railway Company as well, will take charge of cargo at inclusive through rates to any town in Great Britain. The Docks are also in direct communication with all the inland canals, and the transhipment of cargo to coastwise ports may be arranged at regular and frequent sailings.

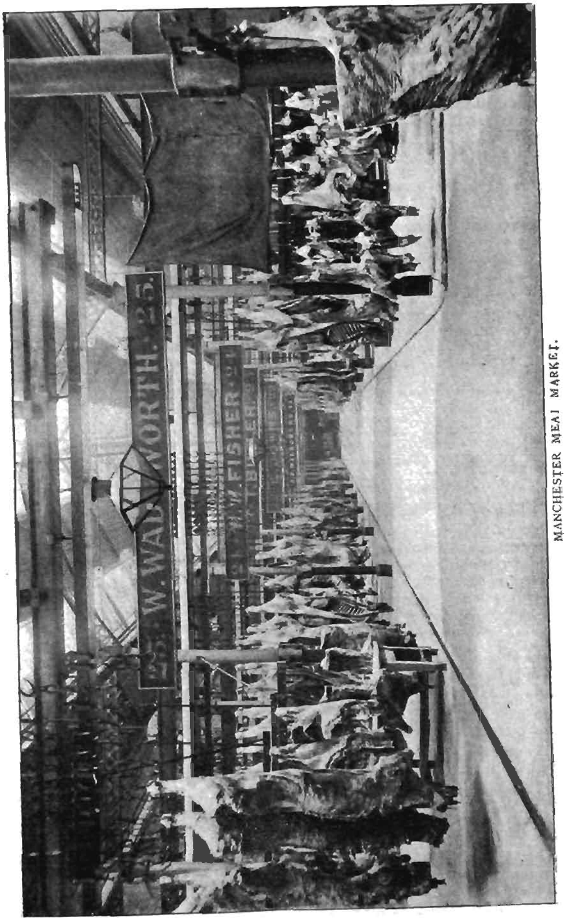
The difficulty, indeed, is not to enumerate the facilities at the docks for oversea trade, but to detect the absence of even the least important of modern appliances for the handling and distribution of produce from distant ports.

COOL STORES.

At No. 9 Dock the Company has erected a most extensive transit shed. In this shed may be placed cargo not for immediate distribution. The shed is an immense, four-floored, ferro-concrete structure. One of the floors, 123 feet long, 99 feet wide, and 7 feet 5 inches high, has been insulated, and has a capacity for frozen produce of 82,500 cubic feet.

There is another cool store at the Docks, erected by the Union Cool Storage Company, and this store is capable of accommodating 175,000 carcases. Further, the Manchester Corporation has cool stores capable of accommodating 120,000 carcases, in the centre of the city, near the important markets and within a very short distance of the docks. The Union Cold Storage Company also has a cool store in the city, with accommodation for 80,000 carcases.

The situation and construction of the Canal Store renders it possible to receive frozen produce at the same temperature as that prevailing in the hold of the vessel whence it came. The cargo may then be distributed in covered carts for town delivery, or insulated vans for distant destinations. Delivery of perishable cargo, with the minimum handling, is thus expeditiously accomplished.



MANCHESTER MEAT MARKET.

FRUIT.

The Manchester Fruit Market offers unique attractions to the Victorian grower and seller. The commercial sale rooms, situated in Deansgate, are the centre of the fruit trade. On sale days, Tuesdays and Thursdays, this extensive building is filled with buyers from the many surrounding and far distant towns. Many tiers of seats are constructed in semicircular form, so that each buyer has an equal opportunity of inspecting and bidding for the various lots. In the "well" of the room are lifts which rise from the cellars beneath, with samples of fruit brought from the docks. Standing on the rostrum the auctioneer sells lot after lot, with such rapidity that huge cargoes may be disposed of in a single sale day.

As soon as the fruit is sold, forwarding orders are placed in the hands of canal and railway officials. The orders are then conveyed by frequent messengers to the docks, and it very often happens that before a buyer leaves the sale rooms the major portion of his purchases is loaded into railway cars and despatched to inland destinations.

Unfortunately, very little of this fruit so expeditiously disposed of is Australian. At any rate, it does not come from the Commonwealth direct. On a recent sale day the fruit offered at this market included :—

7,681	Barrels Canadian apples.	
2,000	Barrels American apples.	
73	Boxes Californian Newtons.	
13,647	Cases Valencia oranges.	
9,142	Cases Valencia onions.	
3,568	Packages lemons	from Spain and Italy.
1,998	Boxes lemons	
356	Cases lemons	
177	Packages mandarines.	
Total 38,642	packages.	

I had the good fortune to interview Mr. W. Webster, a leading wholesale fruit buyer and seller. Mr. Webster has an extensive experience of the Australian fruit trade. He informed me that our fruit is not always carefully packed. Indifferent packing, he said, incalculably injures the prices, as such prices are invariably based on the inferior and not the better produce. Fruit should also, he considers, be shipped more promptly. He further thinks the Australian grower should insist on proper grading of fruit, and the export of inferior quality should be prohibited; higher general prices all over the United Kingdom would then be secured where Australian fruit is sold. But under existing conditions the greatest damage often occurs between the time the fruit is landed at London or Liverpool and the time it is sold in Manchester. It is plain that fruit undergoes more handling during that period than it does during the whole of the transportation from the orchard in Victoria to landing in England.

The dealer naturally desires to obtain fruit out of the ship as soon as possible after discharging commences so that deterioration may be minimized, but this is not practicable when it comes by way of London or Liverpool. Neither Liverpool nor London possesses adequate rail facilities at the docks, and the fruit must consequently be carted to a depôt, entailing double handling and extra expense.

Buyers regularly visit the Manchester market from as far north as Carlisle, as far south as Birmingham, from Hull in the east and from other distant places. Carlisle is 120 miles, Birmingham 83 miles, and Hull 93 miles from Manchester.

The respective charges on fruit consignments sold at Manchester and London are:—

Manchester.	*London.*
6d. per box of 40 lbs., *plus* 2 per cent. for brokerage for sale in the auction-room and guarantee of proceeds.	9d. and 10d. per box of 50 lbs., plus 5 per cent. for brokerage and guarantee of proceeds.

These include the dock charges in both instances.

The following statement furnishes some evidence of the efforts made by Canadian and American traders to supply the Manchester market:—

Direct Sailings from North America to Manchester.

From	Sailings.
Montreal	Weekly.
Quebec	Weekly.
Halifax	Fortnightly.
St. John (Winter)	Fortnightly.
St. John (Summer)	Three-weekly.
Boston	Fortnightly.
New York	Fortnightly.
Philadelphia	Fortnightly.

There can be no doubt that the Victorian grower of grapes for export has, owing to fall of the seasons, a great advantage in the markets of Great Britain over the growers in the Northern hemisphere. The distance of Victoria from Great Britain, however, makes it necessary to secure the nearest market in England, and the market where such perishable fruit as grapes would be subject to the least possible handling. The West of England is nearest. Grapes would be subject to fewer handlings at Manchester, and I venture to say that such fruits could be delivered at the London market through Manchester at less risk than they could by way of the London Docks. It is not too much to say that the future of the export trade in fresh grapes from Australia largely depends upon the opening up of direct transport facilities with the West of England.

The following figures prove that other fruit-producing communities consider Manchester a most profitable market:—

In 1894 (the year the Ship Canal was opened to traffic), 17,723 tons of fresh fruit were landed at Manchester from oversea.

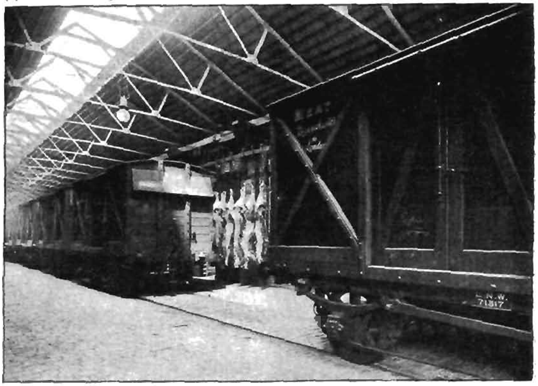
In 1902 the tonnage had grown to 46,935, and in 1909 to 115,947.

FROZEN MEAT.

Even under the present unsatisfactory conditions. Lancashire is said to be the largest consuming county in the United Kingdom for Australian mutton. Experts have informed me that Australian carcases which are small and lean are peculiarly popular among the working classes. Since the inauguration of the Frozen Meat Trade the Argentine producers have, with great keenness, studied the tastes of the operators in the Lancashire and Yorkshire Mills, and now produce a meat which is well known and liked; consequently, Argentine mutton sells at a better price than Australian mutton. My informants are, however, of the opinion that if the Australian producers studied the requirements with equal care, and arranged direct shipments, the Australian mutton would command better prices. The factory operatives do not desire fat meat. New Zealand mutton is considered too fat, too large, and too dear for the working classes. That from the Argentine and Australia is more suitable, and the South American mutton, though similar in character to Australian, is most in demand, because it looks brighter and is of better appearance.

Australian lambs are sold at the Manchester Meat Market on their merits, and are sometimes preferred. I interviewed the Manager of the Compagna Sansinena de Carnes Congelados, who informed me that he bought quantities of Australian lambs to be sold along with River Plate sheep on his stalls, as his company cannot always obtain a sufficient quantity of South American lambs. The American Meat Companies, such as the Swift Beef Company, the Morris Beef Company, and others, also sell Australian lambs on their stalls in the Manchester Meat Market.

This fact alone is of great importance. It indicates that the American and Argentine people appreciate the quality of Australian lambs; that it is popular in the West. It shows, too, the importance of developing the market, for the Argentine people are working up to the requirements, and it is reasonable to predict that the American buyers will not purchase for sale Australian lambs if they can obtain American. No time was more opportune to exploit this excellent market.



MEAT-LADEN TRUCKS—MANCHESTER TO LONDON.

Table showing the saving in Distribution of Frozen Meat from Manchester to North of England Towns.

Frozen Meat, ex Ship to—	From London. Per Ton.	From Manchester. Per Ton.	Saving per Ton.
	£ s. d.	£ s. d.	£ s. d.
Bolton	2 16 10	0 14 3	2 2 7
Bradford	2 10 0	1 5 0	1 5 0
Halifax	2 12 6	1 3 8	1 8 10
Leeds	2 10 0	1 5 0	1 5 0
Oldham	2 10 0	0 15 2	1 14 10
Rochdale	2 17 6	0 15 2	2 2 4
Sheffield	1 14 2	1 2 6	0 11 8

It is apparent that, in spite of the many handicaps to which Australian mutton is subjected in competing with South American meat, a considerable quantity of Australian is already consumed in this district, and it is there

fore obvious that a ready market would be found for a large quantity of Australian meat yielding a greatly enhanced return to the producer, if the unnecessary handling and expense of transit were eliminated.

It may be submitted that the Manchester people themselves should endeavour to secure direct Australian trade, but we should remember that they are the purchasers in this case. The Australian producers are the sellers, and the seller usually arranges that no obstacle to his trade will long remain unremoved.

Butter, Wool, Wheat, etc.

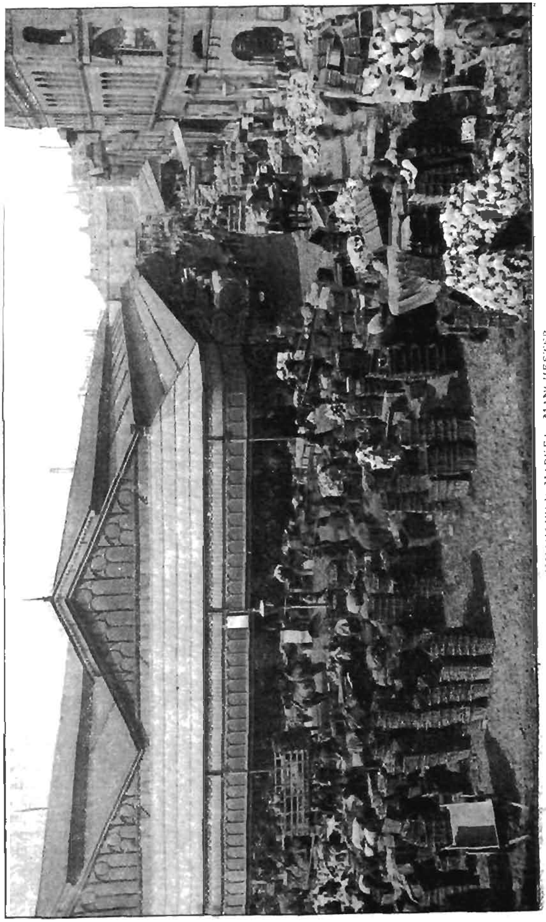
There are, I believe, complaints with respect to the handling of Victorian butter in London, and it is evident that if the butter from Victoria which is consumed in Lancashire and Yorkshire were sent direct, such difficulties would not exist. This produce at the present time reaches Manchester by rail, and a direct supply would mean that the dairy produce would be placed, at the lowest cost and with the least possible handling, into probably the largest centre of butter consumers in England. Regular shipments would make Victorian butter familiar just as Danish butter, which holds the market at present, is familiar and popular. The Danish exporters thoroughly study and cater for the market and the excellent result of their efforts is obvious to any one who has investigated the circumstances. There would be a saving in time, and 25s. per ton in rail charges, if this produce were consigned direct from Melbourne, and in addition to these advantages to the direct exporter his produce would reach the market in a much more satisfactory condition.

Further, if might be mentioned that butter may be sent from Manchester to Bolton at 21s. 7d. per ton less than from London; to Leeds at 30s. 7d. per ton less; and to Oldham at 19s. 6d. per ton less. These are only a few instances, but they indicate the general saving in railway freight.

I have referred to the three chief perishable exports, viz.: meat, butter, and fruit, but the Western market is plainly attractive to exporters of wool, grain, tinned meats, tallow, rabbits and indeed all the exportable merchandise that Victoria can produce.

At the docks there are spacious wool-sheds, with ample floors, specially adapted for the sorting of the bales of wool into different marks and numbers. The wool may then be immediately loaded into railway waggons for Bradford, Huddersfield, Leeds and other Yorkshire manufacturing centres. Wool bought at the Australian sales and consigned direct to Bradford, can be sent from steamers discharging at Manchester at a lower cost than from either London or Liverpool.

The great grain elevator at the docks is said to be one of the most up-to-date in the Kingdom for rapid discharging from steamers, storage and loading into waggons for distant towns, or carts for local delivery. Cargoes of grain come regularly from most other parts of the world to Manchester, which is some evidence of the excellent facilities for distribution. But I was informed that grain shippers in Australia often—for what reason I was unable to discover—accept sailing-ship charter parties containing such clauses as: "Manchester Ship Canal excluded." I believe it was agreed by the Chambers of Commerce of the Commonwealth and the Sailing Ship Owners Documentary Committee in London, that the new Charter Party of 1908 should be used. This document has the clause relative to Manchester thus:—"Excluding Manchester Ship Canal above Runcorn Bridge," which admits of the sailing vessel being ordered to Runcorn on the Ship Canal, whence grain may be barged to the elevator. When the clause excluding Manchester altogether is inserted, the exporter



SMITHFIELD MARKET, MANCHESTER.

loses a valuable market because the vessel cannot be ordered to proceed to the Canal should the cargo be sold to a Manchester importer, but otherwise the vessel may be sent to Runcorn which is half way up the Canal.

This applies to sailing ships, owing to their difficulty with their high masts, to navigate those parts of the Canal which are spanned by bridges. But when steamers are chartered it would seem that no such reference whatever to Manchester should be made in the charter party as steamers have no difficulty in proceeding to and discharging alongside the grain elevator and Manchester is one of the recognised safe ports.

With respect to tinned meats, the operatives in the Lancashire and Yorkshire Mills are very partial to tinned meats from Australia, and, in fact, in no other district in the country is there a greater demand. This trade is growing rapidly, though the goods find their way to their destination in a roundabout manner—through London or Liverpool.

What has been written in the foregoing pages about specific products, applies with equal force to other merchandise, and the difficulty in every respect is the absence of direct transportation facilities.

While the purpose of this report is to call some attention to the facilities which Manchester offers, no inference should be assumed that produce should be necessarily diverted from London or Liverpool. On the other hand, much still remains to be done to thoroughly exploit, at all events, the London market. It is obvious, however, that if the produce which is actually consumed in Manchester and the vicinity were shipped direct, the Victorian grower would benefit in no small degree. Such cargo would reach its destination sooner, at less cost, it would be subject to fewer handlings, and I venture to say better all round prices would be secured. Every one interested will admit that direct trade with the West of England for produce which is consumed in the West is more advantageous, both to the buyer and the seller, than that the produce should go first to London in the South-east, and then sent on by rail. But it may be contended that at the present time there is an adequate service to the West through Liverpool. This contention is, however, fallacious, because at present all regular steamers bound for Liverpool call at London first, then go on to Liverpool. Such vessels carry London cargo as well, and in many cases the Liverpool goods are actually taken out of the holds at London, exposed on the wharves in a changed atmosphere, returned to the holds after the London cargo is landed, and then taken on to Liverpool. The possible damage to perishable produce consigned to Liverpool under these conditions, is difficult to estimate, but it is certain that some deterioration must inevitably take place.

The tendency of other exporting countries is distinctly towards distributing their produce among the many British markets. Australian shippers send almost everything to London, whether it is consumed in London and the vicinity or consumed on the other side of England.

It has, I hope, been shown that the unexploited markets of the West, which are already favourable to us, are little less important to the rural community of Victoria than the markets of London itself. There can be no question that the facilities for receiving and distributing at Manchester are incalculably superior to those at London. Yet at the present time all the steamers, without exception, trading regularly between Great Britain and Australia, go first to London, and the big majority never call at the Western ports, while not one vessel trades regularly from Australia to Manchester. It is impossible to believe that this anomaly can long exist.

GENERAL INFORMATION.

Manchester Charges.—The Manchester charges on the following produce from *ex* steamer at the Manchester Docks to the markets in the City would be:—

	Per ton. £ s. d.
Apples—	
Canal tolls ...	0 4 0
Quay porterage ...	0 1 6
Cartage from docks to market, about ...	0 2 6
	0 7 5
Frozen Meat—	
Canal tolls ...	0 6 0
Quay porterage ...	0 1 0
Cartage from docks to market, about ...	0 2 0
	0 9 0

If the meat went through the refrigerated transit chamber instead of being sorted on the open quay, the charge would be 2s. 6d. per ton in lieu of 1s. per ton for quay porterage.

Butter—	
Canal tolls ...	0 5 0
Quay porterage ...	0 1 6
Cartage, about ...	0 2 0
	0 8 0

Manchester Importers.—The names of the principal frozen meat importers and distributors are:—

S. V. Nevanas & Co., Elm-street, Manchester.
William Brown Ltd., Tack-street, Manchester.
J. C. Farrar (Broker), Corn Exchange, Manchester.

The butter importers are:—

Co-operative Wholesale Society, Balloon-street, Manchester.
Pearson & Rutter, Fennel-street, Manchester.
Wall & Co. Ltd., Greenwood-street, Manchester.
Andrew Clement & Son, Greenwood-street, Manchester.
F. Hunter Ltd., Corn Exchange, Manchester.
P. Hickey, Fennel-street, Manchester.
W. H. Tutton & Co. Ltd., Lancaster-avenue, Manchester.
H. H. Sidebottom (Broker), Corn Exchange, Manchester.
J. C. Farrar (Broker), Corn Exchange, Manchester.

Co-operative Wholesale Society.—The Co-operative Wholesale Society is also a large buyer of all kinds of Australian produce, such as wheat, butter, mutton, lambs, tallow, &c.

Fruit Brokers and Dealers.—The following are the names of some of the fruit brokers in Manchester, to whom the Victorian fruit exporters might communicate regarding their produce:—

J. & H. Goodwin, Commercial Sales Rooms, Deansgate, Manchester.
North of England Fruit Brokers Association, Commercial Sales Rooms, Deansgate, Manchester.

These firms sell the fruit at the public auction, and this would be the best way of disposing of large quantities, say of apples, and developing a wide-spread and reliable market for the growing output.

For small consignments of a few hundred boxes the following fruit dealers on the Smithfield Market are good firms. They are open to negotiate business on the same terms, and in the same way as any other large wholesale firm:—

J. Blackburn, Smithfield Market, Manchester.
Wm. Nicholls & Sons, Smithfield Market, Manchester.
Joel Goodwin, Smithfield Market, Manchester.
Edward Farrand & Co., Smithfield Market, Manchester.

POTATO EXPERIMENTS AT CHELTENHAM, 1910-11.

G. Seymour, Potato Expert.

The operations on the plot at Mr. Wedd's market garden at Cheltenham, in connexion with the potato experiments, were a continuation of the two previous seasons' work, the object being to further test the value of sprouted seed, and also the effect of different manures on the yield of the crop.

The first plot was planted in July, 1907, but in September the crop was cut down badly by frost. It was noted that the early crops in this district in 1905 and 1906 also suffered from the same cause. It was therefore evident that, in following ordinary methods, a satisfactory crop could only be obtained in seasons which were free from frost during the early stages of the plants' growth, and that something must be done to overcome this serious drawback.

Consequently, in 1908, it was decided to tray the seed and plant it in a sprouted condition six to eight weeks later. A portion of the plot was planted with unsprouted seed on 3rd August; the plants came up well, but were cut down twice by frost. The sprouted seed planted on 18th September came up well, and received no check, some varieties showing an increased market value equal to £35 per acre in favour of sprouted seed; the whole field showed an average increase of over 4 tons or £28 per acre. (Potatoes were then selling at £7 per ton.)

This experiment was repeated in 1909-10, the season being favourable for the early crop. The increased yield was over 2 tons per acre. On reference to Table I. it will be noted that one of the varieties which promised best was the only one during the whole series that gave a lighter yield for sprouted seed. See *Journal* for November, 1910, page 718.

For the past season (1910-11) the difference in favour of sprouted seed varied from 2¼ cwt. to 6 tons 6½ cwt. per acre.

TABLE I.—YIELD OF PLOTS, 1908-9 TO 1910-11.

Variety.	1908-9.									1909-10.									1910-11.								
	Sprouted.			Unsprouted.			Difference in Favour of Sprouted.			Sprouted.			Unsprouted.			Difference in Favour of Sprouted.			Sprouted.			Unsprouted.			Difference in Favour of Sprouted.		
	T.	c.	q.	T.	c.	q.	T.	c.	q.	T.	c.	q.	T.	c.	q.	T.	c.	q.	T.	c.	q.	T.	c.	q.	T.	c.	q.
Carman, No. 1 *	6	16	0	1	16	0	5	0	0	6	0	0	8	2	0	2	2	0	10	10	0	5	12	2	4	17	2
Up-to-Date ..	7	18	0	3	0	0	4	18	0	7	2	0	4	14	3	2	7	1	12	0	0	5	13	2	6	6	2
Clarke's Main Crop ..	8	3	0	3	4	0	4	19	0	6	18	0	4	19	0	1	19	0		..			..			..	
Bismarck ..	6	18	0	1	12	0	5	6	0		..			..			..			..			..			..	
Black Prince ..	5	14	0	1	10	0	4	4	0		..			..			..			..			..			..	
Green Mountain		..			..			..			..			..			..		10	2	2	5	17	3	4	4	3
Sutton's Abundance ..		..			..			..			..			..			..		9	0	0	6	8	2	2	11	2
White Prolific ..		..			..			..			..			..			..		8	2	3	5	10	1	2	12	2
Brownell's Beauty		..			..			..			..			..			..		6	0	0	5	17	3	0	2	1
Adirondak ..		..			..			..			..			..			..		4	16	1	4	8	3	0	7	2

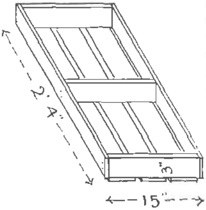
* Yield (2 tons 2 cwt.) given in sixth column is a decrease.

TABLE 2.—PERCENTAGE OF UNMARKETABLE TUBERS, 1908-9 TO 1910-11.

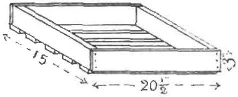
Variety.	1908-9.		1909-10.		1910-11.	
	Sprouted.	*Un-sprouted.*	Sprouted.	*Un-sprouted.*	Sprouted.	*Un-sprouted.*
	%	%	%	%	%	%
Carman	10·4	14·8	37·0	11·5	6·0	7·0
Up-to-Date	15·5	27·0	9·3	15·3	7·8	20·0
Sutton's Abundance ..	..	..	..	..	10·4	20·0
Clarke's Main Crop ..	16·0	42·0	13·0	14·3	..	..
Bismarck	10·8	44·0	..	..	..	..
Black Prince	18·0	51·0	..	..	..	..

TRAYING SEED POTATOES.

The system of traying seed potatoes, or "boxing," as it is sometimes called, has never been practised to any extent in this State, but in Great Britain and Ireland it is generally adopted for the early crop. The results have proved so satisfactory that, in late years, it has been extended to the main crop. Some Scottish growers have treated upwards of 100 tons of seed in this way in one season. Traying on such a large scale should be sufficient proof that it pays, but a number of objections are raised to carrying it out.

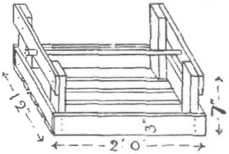


1. TRAY MADE FROM FRUIT CASE.

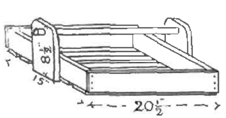


2. TRAY MADE FROM KEROSENE CASE.

The first objection is the expense of trays and shed accommodation. The second is the extra cost of handling the seed at planting time, as it requires more care in cutting and planting than ordinary seed. But,



3. SCOTTISH SPROUTING TRAY.



4. PLANTING TRAY MADE FROM KEROSENE CASE.

allowing for the additional cost, it is evident that it will pay handsomely. The initial cost of the trays will vary, according to durability, from 2d. to about 6d. each. Those used in these experiments were of two kinds, viz., condemned fruit cases cut into two on the flat as shown in Fig. 1, and kerosene boxes cut into three sections on the flat (Fig. 2). Fig. 3 shows the tray used in Scotland and Ireland. By all accounts it is stronger and more durable, and each tray is provided with a handle. The cost of the trays is from 25s. to 30s. per hundred. Fig. 4 shows planting tray used at Cheltenham.

It may be stated that any rough shed can be used for the purpose. The plans and specifications given are those of the shed erected at Mr. Wedd's garden, and which is large enough to contain more than sufficient seed to plant an acre of ground. This will be a guide to those who have no accommodation, and wish to erect a suitable place. The shed may be built higher, as it is useful for other purposes when not required for potatoes. The timber, &c., for this particular shed cost £2 10s., but it is quite possible that the grower will be able to utilize material already on the farm.

I am indebted to Mr. C. M. Neild, of the Engineer's Branch, for the drawings and specifications published in connexion with this article.

It is a question whether the cost may not be reduced in our mild climate by spreading the seed out in a sheltered place to bud, having sufficient trays only to take them into the field for planting.

ADVANTAGES OF SPROUTING SEED.

The chief advantage of sprouting seed in trays is the increased yield in the crop. This is due to the fact that the plants come overground very quickly, and meet with more genial weather than when planted early. They escape the early frost, are more vigorous, and consequently better able to resist disease.

Sprouted seed may be planted eight weeks later than unsprouted, thereby giving a longer period for the removal of the preceding crop. It also affords an opportunity of rejecting "thready-eyed" and weak tubers. Hence, there will be fewer misses in the crop, and less stray varieties to weed out. It also reduces the percentage of small and unmarketable tubers; in some varieties this difference amounted to nearly 30 per cent. in favour of sprouted seed, see Table 2. In every instance the market sample was worth fully 5s. per ton more from sprouted seed.

The seed should be placed in the trays as soon as dug, or as soon as convenient after digging. The filling of the trays is a simple matter. The tubers are poured in, and given a shake to settle them below the level of the tray. Each tray will hold about the following weights, viz., half fruit cases about 24 lbs., one-third kerosene cases 18 lbs. to 20 lbs. The trays may be stacked on top of one another, until the buds begin to move when they should be placed on the racks.

SIZE OF SEED.

In these experiments the average run of marketable and seed potatoes was used; only very large and misshapen tubers were rejected. The large seed was cut freely—much of it to a single eye. The sections were cut as large and as uniformly in size as the tuber would allow, the cutting being done immediately before planting. No material was used to dry the sets.

A test of cut *versus* whole seed was made in the 1909-10 experiments, and was entirely in favour of cut seed. Objection is raised by some growers to planting the stem sections of potatoes. During the 1910-11 work the stem sections of two varieties, Carman and Up-to-date, were planted by themselves. In the case of Carman the crop was not quite so good, whilst in the Up-to-date there was very little difference. In neither was the difference sufficient to warrant throwing away all stem sections.

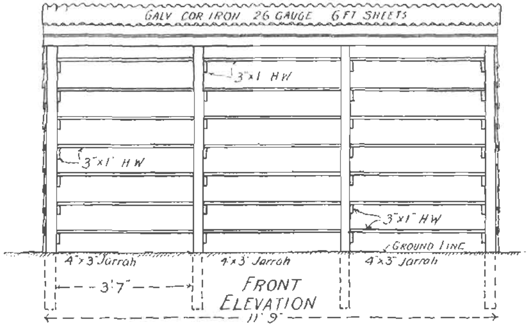
TIME OF TRAYING.

The tubers should be placed in the trays as early in the season as possible. For August-September planting they should be trayed at the

end of April or beginning of May. The trays may be stacked on top of each other at that stage, and when the buds have started they should be placed in the racks to allow the light to green and toughen the sprouts. Sprouting depends much upon the weather. If it is cold and backward, and the buds are not showing, the seed required for early planting may be covered with a little straw, or old bags may be used to exclude the light. When sprouts are produced in this way the seed must be exposed to the light for a week or two to harden them off before planting, but for potatoes trayed in May it will seldom be necessary to resort to these means. The tubers handle best when the sprouts are about 1 inch to 1½ inches long.

The Best Varieties for Sprouting.

All varieties of potatoes are not equally suitable for traying. In some sorts the sprouts do not take hold of the tubers, consequently they break off easily when handling. The following varieties have given



SPROUTING SHED—FRONT ELEVATION.

satisfaction—Carman, Up-to-date, Green Mountain, Sutton's Abundance, Beauty of Hebron, Early Rose, and Bismarck; the first four being the most satisfactory.

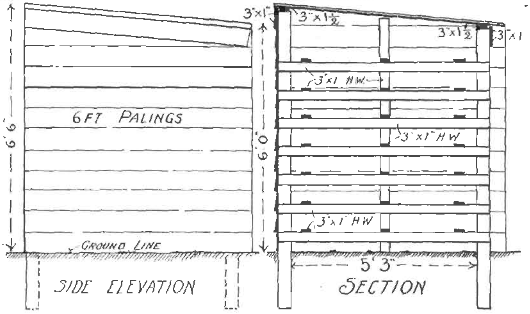
Potato Sprouting Shed.

Select the most convenient position for shed; if it be possible to have the back of shed against a high paling fence, this may form the back wall of shed. Mark on the ground two parallel lines 5 ft. 7 in. apart, to represent back and front of shed; sink four holes 1 ft. 6 in. deep and 3 ft. 10 in. centre to centre on each line exactly opposite one another. The holes should be only large enough to enable the earth to be well rammed round the 4 in. x 3 in. posts. Erect the four 8-ft. lengths of 4 in. x 3 in. jarrah on the line representing the back shed, and well ram the earth round them. Great care must be taken to keep posts perfectly plumb and square. Similarly erect the four 7 ft. 6 in. lengths of 4 in. x 3 in. jarrah on the front line.

On the insides of the posts at each end nail seven 5 ft. 11 in. lengths of 3 in. x 1 in. hardwood, the top of lowest one being 6 in. above the

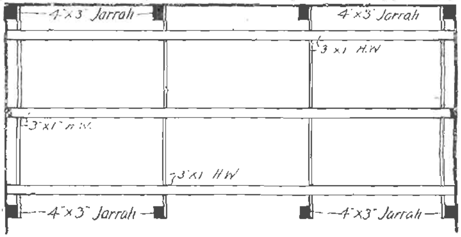
ground, and the others 9 in. from the top of one batten to the top of the next. Similarly nail the other 5 ft. 11 in. lengths of 3 in. x 1 in on the sides of the inside posts.

Nail on the top of the front posts one 3 in. x 1½ in. hardwood batten, and along the front of posts two 3 in. x 1 in. hardwood battens, the top of upper one being level with top of posts. Similarly nail 3 in. x 1½ in and 3 in. x 1 in. hardwood battens on top and back of back posts.



SPROUTING SHED—SIDE ELEVATION AND SECTION.

Cover in the ends of shed with 6-ft. palings nailed horizontally on the outside of posts, beginning at the bottom; fix the top paling on a line with the slope of roof. Stiffen these palings in the centre by nailing on to a 3 in. x 1 in. hardwood batten. Cover in back of shed with 5-ft. palings nailed horizontally on to outside of posts and lapped at joints.



SPROUTING SHED—PLAN.

Cover in the top with 6-ft. sheets of 26 gauge galvanized corrugated iron secured with 2 in. galvanized springhead nails at every second corrugation to the 3 in. x 1½ in. batten fixed on the top of posts. Iron to be lapped half a corrugation and turned down over the outside of end walls and nailed.

The 3 in. x 1 in. hardwood battens, running along the length of shed and resting on the battens which are nailed to the side of posts, are not

to be secured; these can be moved about to suit the particular length of tray which may be used. Each tier will take two rows (9 to each row) of trays made from fruit cases cut in half as shown in sketch, and will require three battens in each tier to support them. If the trays are made from kerosene cases, each tier will take three rows (nine to a row), and will require four battens in each tier to support them.

All the nails, as far as possible, should be skew-nailed.

QUANTITIES.

Posts—Jarrah, 4 in. x 3 in., 4, 8 ft.; 4, 7 ft. 6 in.
Battens—Hardwood, 3 in. x 1 in., 28, 5 ft. 11 in.; 2, 6 ft. 3in.; 21, 11ft. 0 in.
Battens—Hardwood, 3 in. x 1½ in., 2, 11 ft. 9 in.
Palings—24, 6 ft.; 36, 5 ft.
Iron—26 gauge galvanized, corrugated, 6, 6 ft.
Nails—1 lb. 3 in., 1 lb. 1½ in., ½ lb. galvanized springhead nails.

Total cost in Melbourne, £2 10s.

If trays made from kerosene cases be used, seven more 5 ft. 11 in. lengths of 3 in. x 1 in. hardwood will be necessary.

MANURIAL EXPERIMENTS, 1910-11.

No. of Section.	Manures used per Acre.	Cost of Manures per Acre.	Yield per Acre.	Value of Crop at 80s. per ton.
		£ s. d.	Tons cwt. qrs.	£ s. d.
1	5 cwt. Superphosphate and Bonedust ..	1 1 10½	10 5 2	14 2 [illegible]
2	5 cwt. Bonedust and Superphosphate, 2 trucks Stable Manure	3 17 10½	13 10 0	54 10 0
3	4 cwt. Bonedust and Superphosphate, 2 trucks Stable Manure, 1 cwt. Sulphate of Potash	4 7 4½	11 14 1	46 18 0
4	4 cwt. Bonedust and Superphosphate, 2 trucks Stable Manure, 1 cwt. Sulphate of Ammonia	4 8 6	15 3 3	60 18 0

The manurial dressings per acre were as follows:—

1. Bonedust and superphosphate, equal parts, 5 cwt.
2. Bonedust and superphosphate, equal parts, 5 cwt.; stable manure, 2 trucks.
3. Bonedust and superphosphate, 4 cwt.; sulphate of potash, 1 cwt.; stable manure, 2 trucks.
4. Bonedust and superphosphate, 4 cwt.; sulphate of ammonia, 1 cwt.; stable manure, 2 trucks.

Previous operations on these plots have shown that the most satisfactory results have been obtained from a combination of bonedust and superphosphate, 6 cwt. per acre, and a moderate dressing of stable manure. Hitherto, no very satisfactory returns have been obtained from the use of nitrogen or potash. The former has always shown in a marked degree during the growing period by producing a profuse growth of haulm without a corresponding result in the crop of tubers. In the case of potash the results have been still more unsatisfactory. The plants with this manure did not at any stage of growth indicate a beneficial effect and the yield of the crop was smaller. Taking section 4 of 1908-9 plot, it will be seen that the minimum dressing of stable manure and 6 cwt. of bonedust and superphosphate, and 1 cwt. of sulphate of potash gave 1.40 tons per acre less than section 3, without potash; there was also a larger percentage of unmarketable tubers per acre.

In the tests carried out in the 1910-11 series, section 1, with a dressing of 5 cwt. bonedust and superphosphate, gave the very satisfactory return of 10 tons 10 cwt. 2 qrs. per acre. Section 2 received two trucks of stable manure in addition to the 5 cwt. of bonedust and superphosphate, of section 1, at an additional cost of 56s. per acre, but resulted in an increased yield, equivalent to 3 tons 4 cwt. 2 qrs. of marketable tubers worth £12 18s. per acre.

In the case of sections 3 and 4 (1910-11) the dressing of bonedust and superphosphate was reduced to 4 cwt. per acre; section 3, dressed with 1 cwt. sulphate of potash, showed practically no difference in the growth of the plants and only yielded 11 tons 14 cwt. 1 qr., or 3 tons 9 cwt. 2 qrs. less than section 4 for the same cost in manure.

Section 4, which received the nitrogenous dressing, showed an unusually profuse growth of plant during the whole growing period which was reflected in the crop of tubers—a yield of 15 tons 3 cwt 3 qrs. per acre.

The past season was very favourable during the whole growing period for both the early and late crops. This no doubt accounts for the satisfactory results obtained by the use of sulphate of ammonia, which shows to advantage in all soils during the early period when there is abundant moisture. It always happens that this section gives the poorest return if a dry period occurs during the tubering stage of the plants. It is a singular fact that potash in the form and quantity applied in these experiments has never given satisfactory returns. This is a matter that calls for further investigation as to whether better results may not be obtained from this ingredient of plant food in other forms; also whether a more liberal dressing might not be necessary.

The results of the manurial dressings on those plots extending over four seasons point to the following conclusions:—

1. That the most profitable manure is a mixture of bonedust and superphosphate, up to 6 cwt. per acre, combined with a moderate dressing of stable manure.
2. That potash, as applied in these experiments, has not increased the yield.
3. That the beneficial results from the use of sulphate of ammonia depend on the supply of moisture right through the life of the plant, and are confined to seasons of abundant rainfall.

A BEE-KEEPERS' FIELD DAY.

F. R. Beuhne, Bee Expert.

In America and Europe, meetings of apiarists are often held during the honey season at well-managed apiaries, the object being to impress upon the visitors the advantages of the latest appliances and labour-saving methods by enabling them to see the work actually performed. On the 11th January the Stawell Apiarists' Association held the first meeting of this kind in Australia at Mr. F. C. Best's apiary at Great Western. The attendance of over 100 bee-keepers showed that the effort was well appreciated.

One of the recent developments in apiculture is the employment of larger extractors, driven by motor power, in the larger apiaries. By this means the work of extracting is performed, not only more quickly, but more thoroughly. The empty combs, when leaving the machine, are much better cleared of honey than if treated in a smaller hand-driven machine.

A Gould eight-frame reversible extractor, driven by a motor and operated by Mr. F. Barnes, formed the centre of interest. A number of the apiarists present took it in turn to remove the full combs from the hives and, after shaking and brushing off the bees, to wheel the load to the honey house, and there uncap the combs ready for the extractor. Each operator did the work in a somewhat different way, and each was keenly watched by the spectators and commended or criticised.

The uncapping of the combs was done over a cappings reducer, also a recent invention. This is an apparatus heated by a blue flame or a Primus stove. It consists of an outer and an inner case of tinned copper, forming a square hot-water-jacketed vessel, two opposite sides of which are connected near the top by means of transverse square tubes. These are set ⅛ inch apart, and form a grid upon which the cappings fall as they are sliced off the combs. When coming into contact with the hot tubes, the wax melts and, with the honey adhering to the cappings, passes through between the tubes into a receptacle located underneath. In this, by reason of their different specific gravities, the honey, refuse and wax separate into different layers. By the employment of the U-tube principle, the honey escapes through an adjustable elbow tube, the wax overflowing by a separate outlet, while the refuse, generally known as "slumgum," remains in the receptacle from which it may be removed at the end of the day's work.

BEE-KEEPERS AT MR. BEST'S APIARY, GREAT WESTERN.

The saving, in a marketable form, of the wax contained in old black brood combs was the subject of another demonstration in which great interest was taken. This wax is usually partly, and often wholly, wasted through the difficulty of separating it from the many thousands of cocoons. These it covers with a fine coating which the ordinary means employed fail to remove. A hot-water wax press, however, forces this out by pressure, leaving only such traces of wax in the refuse that, if obtained, would not pay for the labour of subjecting the material to a second boiling and pressing.

Many of those who attended the meeting came considerable distances, but all expressed themselves well satisfied with what they had learned. There can be no doubt that much more benefit results to bee-keepers from seeing a thing actually done, than from hearing or reading about it. It is to be hoped that similar gatherings will be held at other centres.

TOBACCO CULTURE.

(Continued from page 87.)

T. A. J. Smith, Tobacco Expert.

HARVESTING.

In Victoria, the tobacco crop ripens somewhat unevenly and cannot be cut in a face like a crop of oats or wheat. It is highly essential that each plant be cut at the right stage of ripeness; over-ripe tobacco never cures as nicely, neither is the quality so good. The leaf becomes hard and woody and its appearance also suffers; very frequently small brown spots occur in considerable quantities and these patches never cure, but remain hard and brittle making the leaf unfit for outside wrapper or bunch wrapper. If the plant is harvested too green there will be loss in weight, and the leaf will cure a dull olive colour, with little flavour, and when smoked a green taste will be observed.

RIPE HESTER TOBACCO, GOVERNMENT FARM.

Of late years, it has been found that, in order to obtain a lesser amount of nicotine, it is often wiser to cut tobacco just before the plant arrives at its fullest maturity, especially when grown on very rich soils. In tent-grown leaf for cigar purposes, the crop does not show the same evidences of ripening, as is the case in the field; the crop is cut from six to eight weeks after topping, it having been found that the leaf loses some of its best characteristics if the plant be allowed to remain longer in the ground.

Again, no little importance depends on the purpose for which the tobacco is to be used. In ordinary heavy plug tobacco, where used only for plug filler, the grower aims chiefly for weight and consequently allows his crops to ripen fully. Though I am of opinion that better smoking qualities would generally be obtained, if the bulk of the tobacco so treated were cut a few days earlier, the cured leaf would not then be quite so coarse and the strength not so great, while the loss in weight would not mean more than 5 to 7 per cent. and would therefore be inconsiderable.

Where harvested for bright leaf, tobacco must be cut at exactly the right stage, otherwise the colour of the leaf will suffer. As this type of

tobacco is used for outside wrapper purposes, this is of paramount importance; if cut on the green side, not only will the colour suffer, but the toughness required in wrapper leaf will be sacrificed and a cover leaf that will crack and break easily will be the result. For this class of leaf every plant should be allowed to ripen well before cutting.

With regard to cigar leaf it is found that, where grown on a sandy warm soil, the plant ripens earlier by at least two weeks than where grown on a cold or clay soil. It is never wise to allow cigar leaf to become at all over-ripe before cutting, as flavour is of even greater consideration in this class of leaf, especially the filler, than in other tobaccoes.

There are two methods of harvesting tobacco intended for manufacture for pipe or plug. The most popular in this country is that of cutting the whole plant, including the stalk, and curing on the stalk in the sheds. The other is stripping the leaves as they ripen and placing them in baskets,

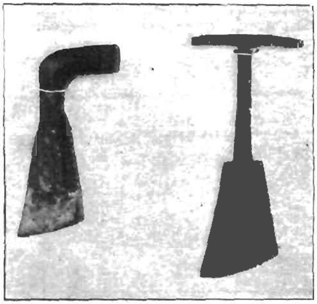
CROP OF LACKS TOBACCO READY FOR HARVESTING.

in which they are carted to the sheds and there strung on twine or tied to sticks. The arguments in favour of the first mentioned system are, that the work is accomplished much quicker and more easily, and that, in the case of heavy tobaccoes, the stalk taking longer to cure helps to keep the leaf from curing too fast in our dry climate during the autumn. It is certainly a cheaper system in that respect, though more apparent than real when everything is taken into consideration.

Where leaf stripping is followed, there can be no doubt that greater uniformity in ripeness is secured, as all leaves on a plant do not ripen quite evenly at once. There is also less shed room required, a matter of moment when timber is scarce and building dear, and a cure is effected more quickly, which is often of advantage. However, the grower must decide for himself, according to his conditions, which is the better system for him to adopt. Cigar tobacco is rarely harvested on the leaf-stripping system for reasons that are given later on.

As tobacco ripens, the plant shows general signs of maturity, the leaves droop and appear heavy, the upper surface becomes roughened, and mottled, and in the pipe varieties especially get gummy and sticky to the touch. This ripening period is somewhat erratic and all plants do not ripen together, though in a crop of 4 or 5 acres it will be found that a fair percentage will ripen about the same time. This is generally, in the case of plug tobacco, about six or eight weeks ofter topping, according to the season; if the leaf does not show signs of ripening at the end of the eighth week it is, as a general rule, better to cut.

Directly tobacco commences to get over-ripe, brown spots appear on the leaf and rapidly spread over the surface. This is a sure sign that the leaf is beginning to waste and no time should be lost in cutting. If, owing to want of moisture or any other cause, the crop stops growing after the topping process and turns yellow, it should be cut at once as loss in weight and quality will assuredly result if allowed more time in the field. Though the yield per acre will be light, such crops often command good value, owing to the golden colour of the cured leaf and its mild aromatic qualities. In some cases, yellow tobacco is grown on soil so poor that it will not properly mature the leaf when the condition referred to ensues and a bright leaf is obtained.



TOBACCO KNIVES.

In harvesting heavy tobacco, the ripe plant is held by the top in the left hand and a knife specially made is inserted in the top of the stalk, where the bud has been removed, and pressed down splitting the stalk to within 6 inches of the ground. Care must be taken to so insert the knife at such an angle as will avoid cutting or breaking the leaves from the stalk. The plant is then bent over with the left hand and the stalk cut or chopped off with the knife close to the ground.

Various knives are used, the best being those illustrated, which can be made by a blacksmith at a cost of a couple of shillings, or by any handy man. In some cases, a light tomahawk, or a heavy butcher's knife is used.

The plant after cutting is left on the ground to wilt for half-an-hour or more, according to the strength of the sun, with the tips of the leaves to the sun. Care must be taken not to let the leaves get scorched under a hot sun; leaf so burned will not cure or make tobacco, but will blacken and become very brittle. If it is not possible, owing to lack of hands or other reasons, to get the tobacco to the scaffold or shed, it should be placed in piles of five or six, one on the other, keeping the butts even both perpendicularly and horizontally, and then taken to the shed as soon as possible. Tobacco should always be carted to the shed or scaffold the same day as cut, and should not be left in thick piles for more than a couple of hours, otherwise it will heat and be damaged. It should be at once hung in the shed, and if that is not possible should be spread thinly, say three deep, under cover from rain and sun.

No tobacco should be cut directly after rain as the gum will be washed out, the enzymes in the leaf cells will be driven out, and a good cure will not be obtained. Neither should it be cut early in the morning before the dew is off, for the same reason, and also because the green leaf will be brittle and break in the cutting process and sand and dirt will adhere to the plants. From 10 a.m. to 4 p.m. on a rather cloudy warm day is the best time for cutting.

Of course, where pests have attacked the crop, cut early and late on the principle that "half a loaf is better than no bread." Frosts can have their damage greatly minimized by burning straw or rubbish between the rising sun and the crop, so as to make a thick volume of smoke break the power of the sun until the frost has melted. Then get all hands to work cutting and carting till the crop is in.

SCAFFOLDING.

Scaffolding heavy tobacco will often be found advantageous, especially where the grower is short of labour. Much time is saved in carting and a quicker cure is effected, but there are several matters in connexion with the practice that require attention, otherwise there is more loss than gain resultant.

TOBACCO ON SCAFFOLD IN THE FIELD.

The scaffold should be built running north and south to allow the sun access to both sides during the day. The poles may be of any length, resting on forks about 6 feet out of the ground. These are placed 3 ft. 9 in. apart, so that each one carries the end of the "hang-stick" on which the tobacco is hung. The hang-sticks are 4 feet long and about 1 inch in diameter. They are generally made of stringy bark whipsticks, or wattle; where these are not readily obtainable, they can be split or sawn from some straight grained wood.

The tobacco, when thoroughly wilted, will be so limp and tough that it can easily be handled without breaking or bruising. It is carted on either a sledge or cart to the scaffold, an open lorry being excellent for the purpose. It is there unloaded on the shady side, care being taken to keep all the plants straight with the butts towards the hanger. Then place them upon the hang-stick which is put across the poles. The plant is taken by the butt in the left hand and given a shake to separate the leaves which will be pressed together by being packed in the cart; if allowed to remain in that condition it will not obtain the circulation of air necessary for a proper cure. The right hand is then inserted in the cleft made by the knife in harvesting and the plant is placed across the hang-stick, leaving the butt about 5 or 6 inches above the stick. The next plant is treated in the same way, about 4 inches dividing each plant. Each stick will hold from eight to ten good sized plants. When the stick is full, the hand should be run along each side of the plants to again loosen any leaves

that may be sticking together. The stick is then carried to the far end of the scaffold and left hanging between the poles; the succeeding sticks are treated in the same way and closed up well together when first placed on the poles. If this is not done, the outside leaves are liable to get too much sun and cure too fast, becoming black and brittle; again, the plants when bunched up close go through a species of green fermentation which improves the colour and quality of the cured tobacco. If the tobacco has not been well wilted before hanging, and consequently cannot be properly bunched up on the scaffold, it is necessary to close up the sticks the day after it is hung.

Tobacco so treated will get a good start in the cure and will gain at least three weeks on that taken straight to the shed. Care must be taken not to let the tobacco get wet. If rain is expected the tobacco should either be protected with a tarpaulin or taken to the shed. From six to nine days is long enough to leave tobacco on the scaffold at any time. At the end of this period it will be found to have lost at least 40 per cent. of its weight, thus saving a considerable amount of carting, either to the shed or scaffold. Treading on the leaves should be avoided, as bruises always show in the cured leaf and spoil its appearance. If carted on a lorry or sledge it should be so packed that the butts of the plants do not injure the leaves by punctures or bruises. When placed on the tier poles in the shed there should be a distance of about 7 or 8 inches between the sticks full of tobacco. If placed closer than this there is danger of mould, and an inferior cure.

It must not be forgotten that scaffolding tobacco is only of advantage in treating heavy plug and sun-cured tobaccoes. Very light tobaccoes and cigar leaf should not be scaffolded, but taken at once to the shed after wilting, there to be cured as described when dealing with curing of the various classes of leaf.

HARVESTING CIGAR TOBACCO.

As previously stated, it is a good system to harvest cigar varieties slightly on the under-ripe side in Victoria, in order to obtain a finer textured leaf; that is, a thinner leaf with smaller vein, and a lighter flavour. The chief fault with a cigar leaf is its coarseness, and strength in smoking; lighter soils for production and closer planting in the rows will have the desired effect in these respects.

It is particularly necessary that cigar leaf should be harvested with special care. The plants should be cut after the dew is off and before the greatest heat of the day, if possible. The plant should then be left only long enough to soften in the sun and be at once taken to the shed when fit to handle.

The mode of cutting differs from that employed in harvesting pipe tobacco. The ripe plant is bent over with one hand and cut off close to the ground with a chopper. The stalk is not split as in the case of heavy plug tobacco. Cigar leaf, being of finer texture than plug, requires gentler treatment. The more torn or bruised it is the less wrapper leaf there will be for market; therefore, it should be carefully handled. Much more depends on the fermentation of cigar leaf; to cut immediately after heavy rain or on a very cold day will be found to seriously affect the fermentation of the leaf later on. This is due to the fact that leaf cut under unfavourable conditions is more or less devoid of enzymes, or ferments, which are developed to a large extent by heat.

The plants, when hung upon the sticks, are tied alternately with twine on each side of the stick and well shaken out before finally hanging in the shed. The reason for cutting the cigar plant without splitting the stalk is to make the cure a slower process; cigar leaf cured fast is too brittle for inside and outside wrapper.

Harvesting Bright Tobacco.

The best system for harvesting the bright aromatic types, which are smaller and finer in texture than the heavy plugs, is to strip the leaf off the plant as it ripens and take to the shed in baskets, where it is strung on twine across sticks and cured by heat artificially. There is very little of this class of tobacco grown in Victoria, though there is ample land suited to the purpose. It should be thoroughly ripe when harvested. The leaves should be strung on twine or wire, or tied by twisting the string round each leaf, or in some cases three leaves together on each side of the hang-stick. Some growers go so far as to carefully string single leaves back to back and face to face, but this I think is somewhat unnecessary, and takes up more room in the shed.

Care in the Shed.

As the tobacco is placed on the lower tiers of poles in the shed it is advisable to put about sixteen sticks of big tobacco in each length of 16 ft. and as many as twenty of small tobacco. As the first floor of the shed is filled it can be raised from floor to floor until the roof is reached. If this system is adopted much heavy lifting will be avoided, as the leaf in drying or curing is losing moisture continuously.

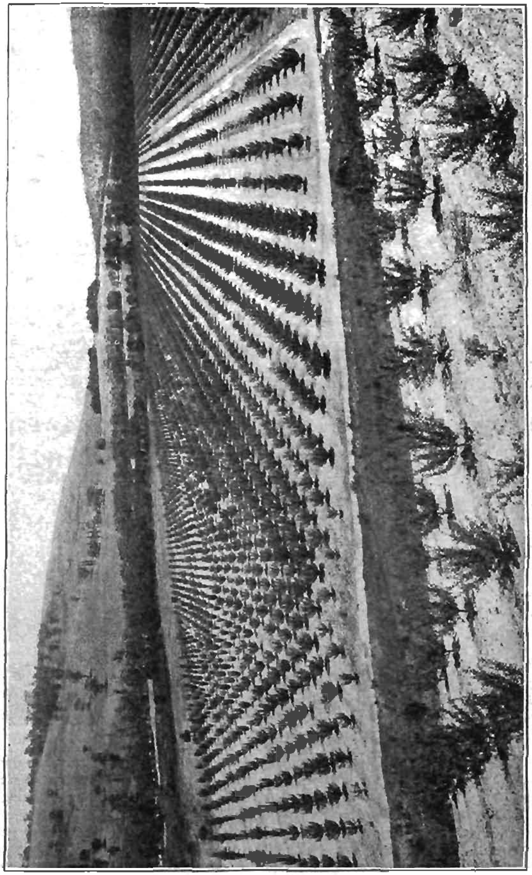
The tobacco should not be bunched too closely as it is raised in the shed, but a current of air should be possible between the sticks on which the plants are hung. As each stick is lifted and placed on the higher tier of poles the hand should be drawn horizontally across the plants to loosen any leaves that may be adhering to others. If much damp weather is prevalent, during the time the tobacco is curing, it is well to go through the tobacco and shake the leaves occasionally by the same process. Tobacco should never be hung close to the ground floor as it will attract the soil moisture and is liable to become mildewed in consequence. There is also greater danger of fire where open pits are used in curing. The floor of the shed should be kept clean for the same reason, as litter in the shape of dried leaves, etc., is liable to be blown into the fire and carried up to the tobacco which is very inflammable when dry.

(To be continued.)

RESULTS OF SPRAYING FOR BLACK SPOT OF APPLE AND PEAR.

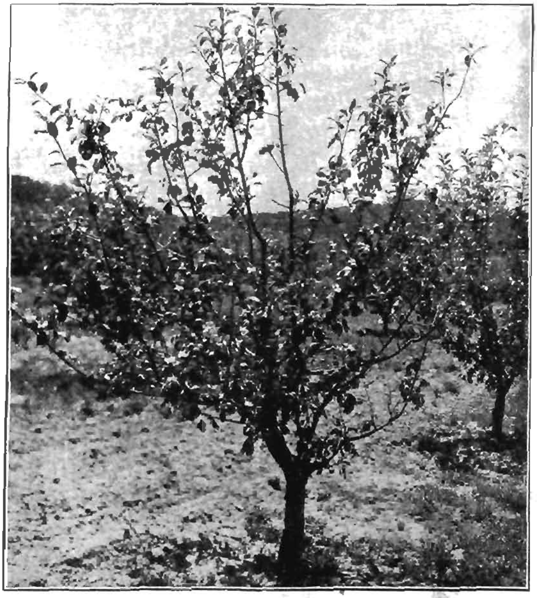
D. McAlpine, Vegetable Pathologist.

It is hardly necessary to enlarge upon the advantages and profit of spraying for this fungus disease, since it has been so long successfully practised by our up-to-date fruit-growers, and its efficacy so clearly demonstrated by numerous experiments in the different States, that spraying is now regarded as necessary for success. Further, the nature and mode of preparation and application of spraying mixtures have been so definitely



1. GENERAL VIEW OF ORCHARD LOOKING SOUTH.

dealt with in this *Journal* and orchard inspectors have so persistently disseminated information, that the best methods are now available to every one engaged in commercial fruit-growing. But the old bug-bear of the weather is every now and then being raised by those who do not take the trouble to properly prepare the mixture or neglect to apply it at the proper time, and the present season has been held up as one which interfered considerably with the success of spraying. No doubt the weather has been such as to give every encouragement to the growth and spread of

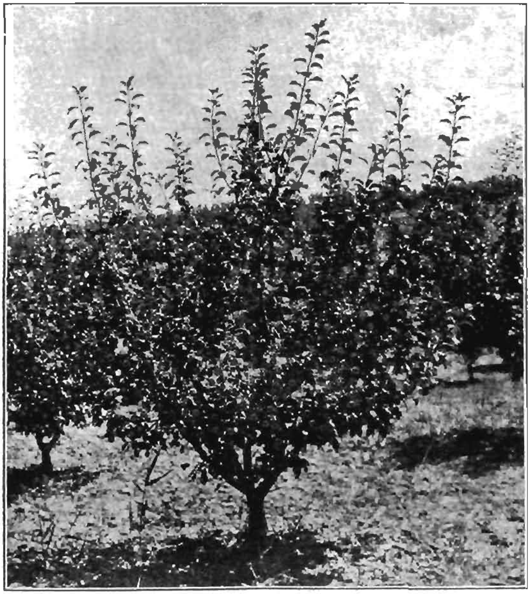


2. YATES UNSPRAYED.

fungus parasites and the heat and humidity combined have aggravated the mischief caused by them when left unchecked, but it is evident that when success has been attained against such fearful odds, the value of spraying is thereby all the more enhanced.

I have therefore simply chosen for illustration one or two instances where the results of spraying were all that could be desired, notwithstanding that the orchards were situated in localities very favourable to this disease, as shown by the photographs of unsprayed trees and their produce. (Figs. 2 and 5.)

The Toomuc Valley Orchard near Pakenham, owned by Mr. Kitchen, and under the management of Mr. Moody, lies in a hollow where a moist and muggy atmosphere often prevails, so that such a fungus as *Fusicladium* thrives vigorously and spreads rapidly. The Yates variety of apple is largely grown here, and this is recognised as being so subject to Black Spot, that it was the variety chosen in connexion with my early experiments on spraying. I visited this orchard on 2nd February, along with Mr. Carmody, Chief Inspector of Orchards, and found it remarkably free from

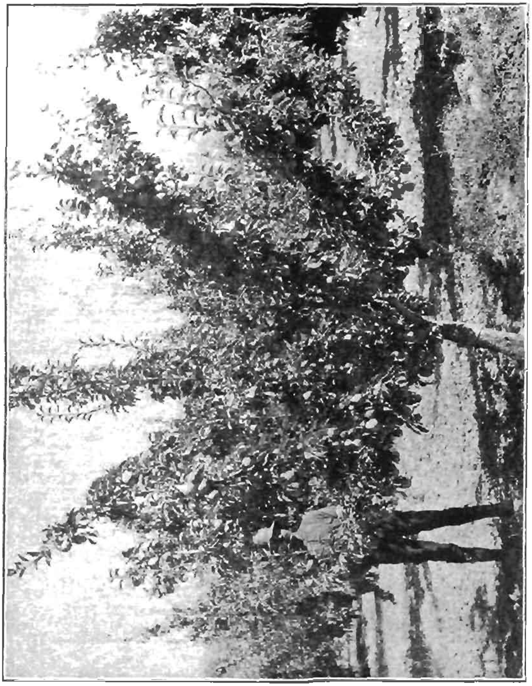


3. YATES SPRAYED.

disease, aided by the drainage which is being further extended, but mainly owing to the spraying operations carried out by the manager. Two sprayings of the Bordeaux mixture were given to the Yates, as in such a variable season it was considered safe to do so.

The first spraying was given when the flower-stalks were distinct and the formula used was 6.4.40 or 6 lbs. bluestone, 4 lbs. fresh quick-lime, and 40 gallons water. The second was given when the apples were forming, at the rate of 6.4.60. The result was that the leaves were beautifully clean and healthy and the fruit shapely and without "spot."

In the stress of spraying operations in such a large orchard, of over 200 acres in extent, (Fig. 1) some of the Yates apple-trees were left unsprayed and the deficiency of leaves owing to the fungus and the fruit not worth picking, show what would have been the condition of the rest of the trees but for judicious spraying (Fig. 3).



4. WILLIAMS' BON CHRETIEN, SPRAYED.

A Williams' Bon Chrêtien pear-tree, about twelve years' old and in full bearing (Fig. 4) is also shown. The spraying was given when the blossoms were at the same stage as in the apple and the formula used was 6.4.40. Then the second spraying was given ten days later with 6.4.70. There was no spot observable on leaf or fruit, even after the most careful examination.

The annual rainfall, over a period of ten years, varied from 23.50 to 35.96 inches, and during 1910 it was not so excessive in

amount as heavy during the spring months, as shown in the table given below :—

5. CRACKED APPLES FROM UNSPRAYED TREE.

Rainfall at Pakenham during 1910.

	Inches.		Inches.
January	1.69	August	2.11
February	0.66	September	4.02
March	2.49	October	3.61
April	0.59	November	1.85
May	1.42	December	3.31
June	1.17		
July	1.23	Total	24.15

Earlier in the season, I had visited an orchard in the Healesville district, under the management of Mr. T. H. Grant. This had been sprayed once with the Bordeaux mixture according to the formula 6.4.40, just before the blossoms had separated, and neither the leaves nor fruit showed signs of disease. That this freedom from disease was due to the spraying and not to favourable weather conditions was abundantly evident in a neighbouring orchard where the trees were unsprayed. The black spot was not only conspicuous on the leaves and fruit, but even on the young twigs and the cracked and distorted apples could not possibly be worse (Fig. 5).

Such examples as I have given (and they could be multiplied) show that spraying prevents the development of black spot, even in a favourable season.

While the efficacy of Bordeaux mixture as a fungicide has been thoroughly established in practice, the result of recent investigations, as to its composition and mode of action, has shown that there are improved forms of it. In Italy, for a quarter of a century, the mixture has been prepared with lime-water instead of milk of lime and this requires much less of the copper sulphate than the ordinary form, to produce the same results. This Italian Bordeaux may also be concentrated in the form of a paste which mixes readily and perfectly with water. The advantages of using a Bordeaux paste are evident. Not only is there a saving of time to the grower in the mixing, and a solution provided without lime particles to clog the nozzle of the sprayer, but with little dams over the orchard, the spraying could be done much more expeditiously. The Copper-soda spray, in which washing soda takes the place of the lime in the ordinary Bordeaux, will also require to be tested as to its effect on the leaves of different varieties, as compared with the other, and during the next spraying season experiments will be carried out in the orchard to determine the cheapest, most effective, most easily prepared and applied form of spray to be used as a fungicide.

A RECORD SHIPMENT OF PEARS.

J. G. Turner, Senior Inspector, Fruit Exports and Imports.

The departure of the s.s. *Somerset* from Williamstown on 14th February last marked an epoch in the oversea export of fruit, and was particularly interesting to all concerned in the industry for several reasons, the chief of which are as follows :—

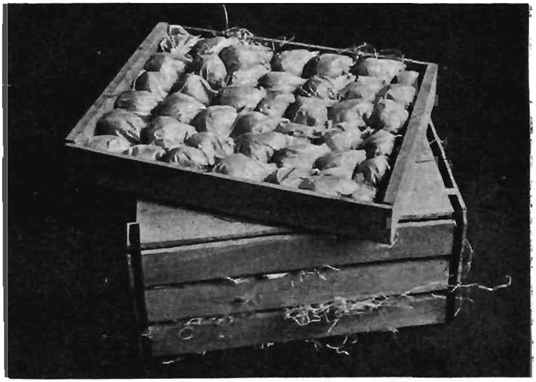
1. It is the first attempt that has been made, on a large scale, to ship fruit under conditions approaching those which experiments here, and in other countries, have proved to be the most suitable for successfully transporting fruits over long distances.
2. The consignment comprises the largest quantity of pears which has ever left the State in one vessel.
3. The variety of pear which has been shipped, and which is variously known as Williams' Bon Chrêtien, the Bartlett or Duchess pear, is one of the earliest pears to mature. Although, in point of flavour, it is one of the best grown, it has not been previously shipped in large quantities by reason of its poor keeping qualities under normal conditions.

THE VENTURE A RESULT OF PREVIOUS EXPERIMENTS.

The present attempt has resulted from the efforts of, and the experience gained by, a few pioneers who have forwarded small lots to Europe and America during the past seven or eight years. In some instances the fruit has been landed in bad condition; but in others it opened up so well that, despite the assertion that this pear would never carry long distances, many growers have come to the conclusion that, with a little extra care, sound fruit can be landed in the United Kingdom and Europe.

Experiments have shown that Williams' Bon Chrêtien pears, if cool-stored immediately after packing and kept at low temperatures, will remain in practically the same condition for weeks at a stretch. Shipments sent to London and New York from South Australia and Victoria, during the last two years, under such conditions realised a profit of 4s. 6d. and 12s. per case respectively.

These successes prompted Victorian growers to take energetic action. A conference of growers held at Ardmona last September decided that a



PEARS PACKED FOR EXPORT.—1. SINGLE TRAY. 2. THREE TRAYS CLEATED.
(For illustrative purposes the wood-wool packing has been left untrimmed.)

shipment of Bon Chrêtien pears be sent during the present export season. In the intervening three months, the Central Association completed the arrangements and the Federal-Houlder-Shire s.s. *Somerset* was selected as the vessel to carry the shipment. Free storage was agreed to by the Minister of Agriculture, and a small charge (1½d. per case) was made to cover cost of handling.

The shipment was timed to sail on 13th February, and space was secured for 11,000 cases. About the beginning of February the first consignments were forwarded from the orchards to the Government Cool Stores. A proportion of these (about two-thirds of the total) was wrapped and packed for export in the orchard. Upon receipt the fruit was immediately placed in the cool chamber and reduced in temperature to about 32 or 33 degrees. The remaining one-third was forwarded unpacked and made up for export at the Government Cool Stores.

Methods of Packing.

The method in which the major portion of this shipment has been prepared for export is as follows:—

The fruit was first graded, wrapped in wrapping paper, and packed in trays measuring 18 inches long, 15 inches wide and 2⅞ inches deep. Each tray, both top and bottom, was packed with a layer of wood-wool. As the trays were filled they were cleated together in lots of three trays with fine hoop-iron nailed around each end of the package. This combination forms a package equal in dimensions to the bushel case. The package was then branded in accordance with the requirements of the Commerce Act and immediately cool-stored. This method of packing was not adopted by all of the shippers. Some few lots were packed in the ordinary "flat" bushel and half-bushel cases which are used in the inter-State trade. These were shipped for the purpose of trying if the fruit would

PACKERS AT WORK. BALES OF WOOD-WOOL IN BACKGROUND.

carry as well in the ordinary packages as in those composed of specially prepared trays. If the results prove favourable it is probable that future shipments will consist largely of the ordinary cases, as the total cost of making these up is considerably less than is incurred in shipping the fruit in trays. Ice-cars were utilized to transfer the fruit from the Government Cool Stores to the ship's side. Each of these cars contained about 450 cases. The fruit on arrival at the vessel's side was at once transferred to the hold where it was placed in a temperature ranging from 30 to 31 degrees.

With the extension of the system of establishing cold storage in each of the fruit-growing centres, and the increased application of more up-to-date and scientific methods of transporting and marketing our fruits, the use of ice-cars will become more and more popular, and will gradually replace the use of the old louvre type which, from its form of construction, (allowing as it does free access to the outer atmosphere) provides, in hot weather, an ideal ripening machine for fruit during transit.

The total cost of each package to London works out at 4s. 10¾d., the details of which are as follows:—

	s.	d.
Trays	1	3
Handling (in cool storage)	0	1½
Rail to ship	0	1½
Ocean freight and insurance	3	1¾
Agency	0	3
	4	10¾

The above figures do not include port charges and commission in London which amount to 7d. and 5 per cent. respectively.

In addition to the pears (5,166 cases), 5,707 cases of apples, 10 cases of plums, 6 cases peaches and 6 cases of grapes were also shipped. The promoters of the venture would have preferred the shipment to consist solely of pears, but owing to insufficient response from the growers they

IN THE FREEZING CHAMBER, GOVERNMENT COOL STORES.

had perforce to fill the remainder of the space with apples. Arrangements were made to have the apples placed in the ship's refrigerator 24 hours before the pears were taken on board. The object of this was to allow the apples sufficient time to cool to a temperature as near as possible to that of the pears.

The general all round excellence of the fruit was a notable feature in connection with this shipment. Though well matured, the fruit was firm, unblemished, and so free from disease, that only three fruits affected with codlin moth were noticed during the packing of over 2,000 cases of pears.

It was originally intended that this consignment would be shipped under the auspices of the Department of Agriculture, and arrangements had been made for the engineer in charge of the Doncaster Cool Stores (Mr. W. French) to accompany the fruit to England. An examination of the arrangements on board the vessel, however, convinced that officer that the

system was better adapted for the carriage of frozen produce, other than pears. He did not think that the Department should accept any responsibility for the proposed shipment; but, at the same time, he thought that, with every care and attention, it would be possible to land the shipment in London in good condition.

LAYING OUT ORCHARDS IN THE IRRIGATED AREAS.

G. H. Tolley, Manager, Wyuna Irrigation Farm.

With the great stream of immigrants now commencing to flow towards Victoria, and the certainty that many of those who settle on the land will desire to establish orchards and vineyards in greater or less degree, and principally in the irrigated areas, a few words on the subject of setting out and planting may save many a novice considerable waste of time and money and assure him that when his work is done nothing more remains to provide for successful and economic working afterwards.

Those whose land needs clearing and grading should peruse the series of articles upon irrigation now running in the *Journal*, while to those where these operations are complete and who are ready to proceed at any time between now and next planting season, which commences in August, the following plan of operations is commended.

Assuming that the land to be operated on is rectangular in plan, and that the position of head ditches has been determined, set out base lines parallel to those fences which run along the longer sides of the proposed orchard, and distant from 15 feet to 20 feet therefrom or from any head ditch which it may be designed to build there. The object of leaving this space is to afford facilities for future horse work; either for ploughing out for irrigation, for cultivation, or for carting produce, prunings, &c. There should be no skimpiness on this account, having in view the comfort of future working when the trees or vines shall have come into full bearing and necessarily occupy considerable space.

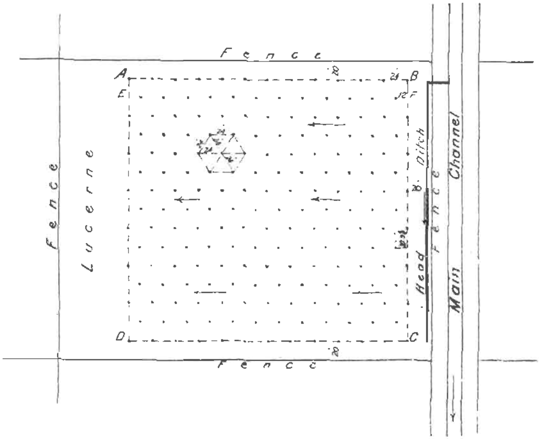
NUMBER OF TREES TO THE ACRE.

Feet apart.	Number of Trees.		Distance in Check Rows.		Feet apart.	Number of Trees.		Distance in Check Rows.	
	Square.	Septuple.	ft.	in.		Square.	Septuple.	ft.	in.
8	680	782	6	11⅛	20	109	125	17	3⅞
9	538	619	7	9½	21	99	114	18	2⅛
10	435	500	8	8	22	90	103	19	0⅝
11	360	414	9	6¼	23	82	94	19	11
12	302	347	10	4¾	24	75	86	20	9⅜
13	257	295	11	3	25	70	80	21	7⅞
14	222	255	12	1½	26	64	73	22	6⅛
15	193	222	13	0	27	59	68	23	4⅝
16	170	195	13	10¾	28	55	63	24	3
17	150	172	14	8⅝	29	52	60	25	1⅜
18	134	154	15	7	30	48	55	25	11¾
19	120	138	16	5⅜					

This table has been computed without making any provision for headlands round the block.

Orchards may be planted either on the square or septuple principle. The foregoing table will serve as a guide as to which system to adopt; but the latter is recommended, for the reason that by its means 15 per cent. more trees may be planted for the same area, and that the position of the trees allows for greater variety of effective cultivation.

Twenty-four feet apart on the septuple principle is recommended as the most suitable distance. The beginner is strongly advised against adopting a lesser distance. The truth of the advice will come home to him when the trees mature. Having adopted this distance, and the width of headland to be left, and having set out base lines as shown in the following sketch at B C and A D, proceed to measure along the line B C, starting from the peg at B, leaving pegs at each interval of 20 ft. 9$\frac{3}{8}$ in. (*vide table*) and in true alignment. Establish a similar line



1. ORCHARD PLANTED ON SEPTUPLE SYSTEM.

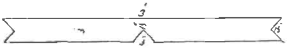
of pegs along the line A D. These pegs are very conveniently made out of scraps of deal or soft wood about 7 inches long by $\frac{3}{4}$ inch wide by $\frac{1}{4}$ inch thick. If no measuring chain is available procure a rod 24 feet long, preferably of light strong wood. It is convenient for transport purposes to have it made in two pieces, each 12 feet in length and hinged so as to fold up. Battens 2 inches by 1 inch will serve the purpose. Mark the distance 20 feet 9$\frac{3}{8}$ inches upon it.

To insure the pegs being truly in line, attach a ring made of $\frac{3}{8}$ inch iron and 3 inches diameter to either end of a piece of No. 10 fencing wire of such length as will suit the particular case, that is, from A to B in the sketch (No. 2). Now stretch the wire along the line A B by driving a spike at the point B to hold one of the rings. Holding the other ring near the peg at A, continue to shake the wire up with a vertical movement

until it apparently lies truly along the line A B. Pass a crowbar through the ring in the position shown in sketch and exert sufficient leverage to draw the wire taut. Then, with the measuring rod, set pegs at intervals 24 feet along the wire. Remove the wire to the line E F and tighten as before, but in this case make the *first* measurement along the wire from F only half the distance, or 12 feet. When all the pegs are fixed along the wire, remove the end ones at E and F to prevent mistakes in planting. When setting the pegs, keep them on that side of the wire away from the rows yet to be marked to prevent pulling them down when shifting. Continue these operations until the paddock is complete, making the first measurement on each line alternately 12 feet and 24 feet. Every peg will now be equidistant—24 feet.

2. METHOD OF PLANTING TREES IN LINE.

When the time arrives for planting the trees, provide a planting board which may be made from a piece of soft wood 3 in. x 1 in. to the following dimensions (No. 3). Lay the planting board on the ground so that the central nick is in contact with a peg, keeping the board in position with the foot. Remove the peg to one of the end nicks and place another peg in the other nick. The hole may now be dug, and if the planting board is replaced the central nick will indicate the position of the original peg and the place where the new tree is to be planted. By following this system, the trees will all be truly in line and a good appearance given to the orchard.



3. PLANTING BOARD.

The depth of holes must largely be governed by the depth of soil, and the nature of the trees to be planted. As a general rule, from 9 inches to 12 inches is sufficient; but it is well to give the bottom of the hole a good stirring, and keep the soil taken out, clear of the planting board. Holes should never be made circular. When the roots of the new trees reach the undisturbed soil they will have a tendency to follow the circular wall. Make the holes square, from 18 inches to 24 inches, and if roots should travel along the walls they will be pretty certain to penetrate when they reach the corners.

4. HOLE FOR TREE.

It will be found that two people will make a better job of planting than one. Before putting the tree into the hole, arrange the bottom earth in the form of a mound as in drawing No. 4. With the planting board in position, place the tree in the hole so that the stem rests directly in the notch and on top of the mound around which the roots should be symmetrically disposed, the strongest roots being kept towards the direction of prevailing winds. Make the soil as fine as possible before refilling, and press firmly around the roots, and should the soil be dry take an early opportunity of irrigating. Before setting the tree, take care to disentangle the roots and to cut off all that are broken and damaged.

When trees are received from a nurseryman, place the roots in a trench and cover with moistened soil until ready to set out. When planting, be careful to keep the bud or graft well above the surface, and in irrigating do not let water come in contact with the stems except by way of seepage.

It is necessary with all young trees to head them back at time of planting in order to insure short stocky stems and symmetrical branches, and the reader is referred for instruction on this point and the subsequent care and treatment of his trees to that excellent work, *Fruit Tree Pruning*, by G. Quinn, and published by the South Australian Department of Agriculture. The horticultural articles contributed to the *Journal* by Mr. E. E. Pescott and other Departmental experts should also be carefully read.

In the sketch will be noticed a strip of land marked "Lucerne." The provision, or otherwise, of this is left to the judgment of the owner. The arrows indicate the fall of the land, and it is obvious that any surplus water from irrigation, or otherwise, must spill over on this strip, unless, in the general scheme of irrigation works, provision is made for drainage. Assuming that it is not, this strip makes a very convenient "safety valve," and precludes any waste, for no matter how careful an irrigator may become, nor how expert, occasions arise when water may come down in excessive volume without the irrigator's volition. Of course, any irrigable crop besides lucerne may be grown, but as the owner will almost certainly possess a cow and one or two horses, abundant rich fodder will be provided with the minimum of effort; and trouble with channel authorities will be avoided.

A good plan in laying out orchards or vineyards, especially in exposed localities, is to provide some sort of breakwind. As it is well to make some profit out of this, the owner is recommended to plant a double row of some good commercial almond, at least along those sides of his plantation most affected by prevailing winds; to completely surround it is preferable. Almonds do not require so much room or attention as most other deciduous fruits. The distance apart for a single row may be 15 feet, and for a double row 20 feet, spacing the trees as in the orchard itself and for which the necessary measurements may be extracted from the table.

Another very excellent breakwind is made from olives and may prove more suitable should there be means of dealing with the fruit commercially. It is a slower growing tree than the almond, but it has the advantage of being an evergreen and of producing a fruit that does not as a rule appeal to the palate of the pilferers. In planting vineyards, whether for dried products or wine, the square system is preferred. A good result will follow from making the rows 10 feet apart and planting the vines 8 feet apart in the rows, except in the case of Zante currants and sultanas, when the vines, which must be trellised to secure best results, may be placed 16 feet apart.

It may happen that some individual circumstances have been overlooked, such as dealing with an area of irregular shape, in which latter case the reader is referred to the article on irrigation previously mentioned. Should further particulars be desired they will be promptly supplied on application.

In conclusion, purchase, if possible, only one-year-old trees or vines; not only is nothing gained by getting them older, but very much is lost. Purchase only from reputable nurserymen who will guarantee the varieties sold.

THE WINE INDUSTRY IN SOUTHERN FRANCE.

DEPARTMENT OF HÉRAULT.

(Continued from page 762, vol. IX.)

F. de Castella, Government Viticulturist

ANNUAL CULTIVATION OF THE SOIL.

Not only as regards preliminary preparation of soil should the vineyards of Hérault serve as an object lesson to Victorian vine-growers. The thorough tillage the ground receives each year, and the manner in which it is carried out, are likewise of considerable interest to us; for they contribute in no small degree to the exceedingly heavy yields characteristic of the region.

Insufficient tillage has been a common cause of small yields in Victorian vineyards in the past. No doubt, the evolution of our viticultural methods, in the direction of more intense culture which is so satisfactory a feature of our replanted vineyards, is correcting many of the errors of the past. Nevertheless, one still finds evidence of neglect in too many of our vineyards; and, even in those where the soil is kept free from weeds and loose during the summer, it is questionable if the work is always performed in the most advantageous manner and at the most propitious moment.

The distance apart and methods of training the vines of Hérault are very different to ours, and exert a considerable influence on the question under review. These features will be dealt with in detail later, and it will here suffice to point out that the usual distance apart is 5 feet by 5 feet and that the vines are neither tied up nor topped in any way during the summer.* Such close planting does not permit the passage of a pair of horses; hence the two and three furrow ploughs we use cannot be employed. The absence of topping has for result that, after a couple of months' growth, whole blocks of vines become an almost continuous mass of verdure, impenetrable to scarifiers, &c. Cultural operations must therefore be pushed on energetically in the early spring, so that the soil is free from weeds and thoroughly tilled, by the time growth is sufficiently advanced to interfere with the passage of implements.

With the exception of the general substitution of animal traction for manual labour, wherever possible, the cultural methods in vogue have undergone but little change during the past hundred years or so. The advantages of thorough tillage have long since been so fully appreciated as to leave little room for improvement in the condition in which the soil of the vineyards has always been kept. Although animal traction is nowadays very much more largely practised than formerly, a change which was inevitable in view of the increase in the cost of labour,† the use of the plough has been general in Hérault for a very considerable time, in marked contrast to the almost exclusive use of manual labour, still common in several more northern districts.

At the present day, in southern France, the vineyards are chiefly worked by implements drawn by horses or mules, this being supplemented by hand hoeing of the portions untouched by such cultivation. Though

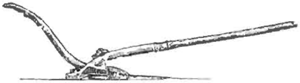
* Until quite recently trellised vineyards were practically unknown in Hérault. Of late years a good many have been established, but the great bulk are still grown without support, and laid out on the square, thus rendering cross cultivation possible.

† In 1908 the ruling rate for vineyard labourers was 5s. 7d. per day of seven hours.

the implements used have undergone some change—far less than might be expected, however—the result aimed at, in the way of perfection of tillage, has altered remarkably little since remote antiquity. It is true that some new ideas involving a modification in the depth of cultivation have recently been put forward in certain quarters. This innovation, which will be referred to presently, has not displaced the ancient system, except in a few special cases.

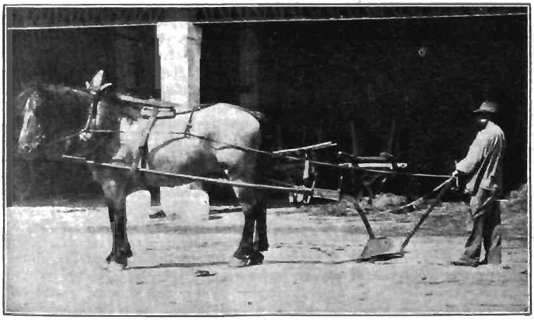
IMPLEMENTS USED.

Thoroughness, rather than speed, seems to be the principle which guides the choice of vineyard implements in Hérault. Australian visitors cannot fail to be struck by the very primitive nature of the ploughs, more especially. They conclude that in this branch, at least, we have nothing to learn from France, and are emphatic as to the great superiority of Australian implements.



ARAIRE—ANCIENT WOODEN PLOUGH.

It is, in fact, rather startling to find, in this region, which may be said to represent the last word in the way of intense culture of the vine, that the wooden plough of ancient Rome is still in very frequent use. This almost prehistoric implement, of which a diagram is reproduced, is the prototype of all the single furrow ploughs now used in Hérault; it therefore deserves more than passing mention. Known in French as *Araire*, and in *Languedocien* (the patois of the country) as *Araire*, it consists of a wooden foot provided with a long steel share. Sometimes it is drawn by a pole to which a pair of bullocks are harnessed; at others



IRON MODIFICATION OF ARAIRE

by a horse or mule, when it is fitted with shafts. In the former case it is known locally as *doublis;* in the latter as *fourcat.* It has no mould-board and throws the soil equally to either side. In order to do good work the furrows, such as they are, must be drawn close together. The soil is worked to a depth of from 6 to 8 inches. This, together with the need for close furrows just referred to, implies much deeper working

and more thorough pulverisation of the soil than is obtained with our more modern ploughs.

H. Marès sums up the defects and advantages of the araire as follows :—

It has the drawback of doing but little work. . . . It is scarcely possible to plough, in one direction, more than 33 ares (.8 acre) per day. . . . . It does not turn the soil over but only loosens it . . . finally, the sole drags along the ground, compressing it, if it be wet.

Its advantages are the following :—It is very cheap (22 francs = 19s. 7d.); it serves for all operations which loosen the soil, in the Midi, since there is no ploughing implement more handy or more simple, when one has to deal with dry soils and work them to a depth of 0.20 metres (8 inches). . . . It becames broken or out of order less than any other . . . and none resists better in stony soils. It can be repaired with the greatest ease.

For ploughing vineyards in shallow, uneven rocky soils . . . I do not know any implement capable of replacing it. To resume, it is still generally preferred and adopted; it works in all soils, good or bad, deep and even, rocky and uneven; it serves for all cultural work. It is cheap, easily kept in order and generally well adapted to the climate and soil in the Midi.

Though this was written over 20 years ago, it is in the main true at the present day and the araire, either in its primitive wooden form, or some modification of it, is still very extensively used; in fact, exclusively so if the land be stony, as it very often is. The two photographs show a favourite modern form, constructed entirely of iron. The system of harnessing by means of a shaft is here shown. In this case the shafts are iron; wooden ones are also used. The extra long steel share is found most convenient in very stony soil. A weed cutting attachment, consisting of two skimmers or wings known as an *hirondelle* (literally, swallow), can be bolted on when required, but the araire is more often worked without it as shown in the photograph. The price of this implement in Montpellier is 25 fr. (£1). The shafts cost an extra 20 fr. (16s.). This system of harnessing is said to render the working of the plough more steady. The shafts do not damage the vines.

FRONT VIEW OF IRON ARAIRE.

Many modern types of plough have recently been introduced, most of which are provided with mouldboards. They are almost exclusively single furrow and work to a depth of 8 inches. As regards scarifiers, the number of new types is considerable. American manufacturers have agencies in most French centres, or else make arrangements for their models to be manufactured in French workshops. The Planet Junior cultivator, for example, exactly the same as the one we are familiar with in Victoria, is manufactured by the firm of Pilter and Co. of Montpellier, and sold under the name of "Pilter-Planet." As regards these implements, most of which are similar to types we know, little need here be said.

The above somewhat lengthy description of the old fashioned araire is, however, necessary, for two reasons. In the first place it shows how the implement we are so ready to class as hopelessly obsolete may yet possess advantages which recommend it, at least for certain work, such as the winter ploughing. There can be no doubt that the heavy crops obtained are in large measure due to the thoroughness with which this operation is executed. It is to this very thoroughness that the survival of the araire is due, notwithstanding the fact that modern American and other ploughs are everywhere obtainable. The French farmer is not unduly conservative; he is, on the contrary, always ready to try new implements and machinery. If he is loth to give up the primitive plough of his fathers it is owing to its efficiency, and not to any other reason.

In the second place, the question presents itself whether we have, in our quest after cheapness and the execution of the greatest amount of work in the shortest possible time, always kept the main object in view. The soils of our vineyards are scarcely ever loosened, in winter, to a depth of anything like 6 inches, let alone the 8 inches frequently attained in Hérault. The advantages of such deep ploughing in the direction of securing reserves of moisture alone, not to speak of aeration of the soil, should be even greater in northern Victoria than in Hérault, with its heavier rainfall and less active evaporation.

HOW THE SOIL IS WORKED.

In order to realize the importance of the different cultural operations performed in the Hérault vineyards, and to thoroughly understand the nature of each, it is necessary to go back a considerable number of years: to the time, in fact, when the whole of the vineyard work was performed by hand. To again quote from H. Marès—

Each working bears a particular name, which testifies to its high antiquity. Proof of the necessity and suitability of each is found in the fact that for more than two thousand years the vignerons of the same provinces have been led to practise them at the same epochs.* The first working bears the name of *Foucha* . . . it should move the soil more deeply than the others; to an average depth of o. m 20 (about 8 inches). When . . . too shallow the soil is not loosened sufficiently and with the first dry weather it loses its moisture, so necessary for the vine to resist the heat of summer.

The second . . . bears the name of *Majenqua*; it is the May working, as indicated by its name. . . . Its object is to kill many weeds . . . and preserve the looseness due to the first working; it should therefore penetrate nearly as deeply.

The third . . . is named *Tierca* or third working. Its object is to break the crust . . . and kill summer weeds. . . . It should be executed from 15th June to 15th July (in Europe) . . . and should penetrate from o, m o8 to o, m 10 (3 to 4 inches).

He points out elsewhere that whilst two workings are absolutely indispensable, the first between January and March, and the second from 15th May to 24th June (in Europe) they are not sufficient. If the best results are to be obtained, it is necessary to interpolate a third one.

Later on, when the araire came into use and was employed to do all work done by animal traction, the three fundamental operations described above were performed with it and supplemented, where necessary, by hand hoeing.

* He here recalls the passage in which Columella says, "Celsus and Atticus agree that there are three natural movements in the vine, or rather in every kind of tree—the first which makes them increase in size, the second which makes them flower, and the third which makes them ripen. They think that tilling serves to animate these movements because Nature only reaches the object of her desires, inasmuch as she is aided by work joined with study."

The first ploughing then consisted in opening up five furrows in each row, this being immediately followed by a cross ploughing, also of five furrows, in a perpendicular direction. This work was followed by hoeing the ground from around the vine into the interval between the rows, the vine being thus situated in a sort of depression or basin.

The second ploughing, also in two perpendicular directions, was given in May. It levelled the ground, filling the basins opened round the vine; if weeds were troublesome it was supplemented by a hoeing.

The third ploughing (again crossed) was executed in early June in the case of spreading growers or a fortnight later, for erect varieties. After this, the passage of teams is no longer possible and any further work must be done by hand, with the hoe.

Nowadays, the first or winter ploughing is performed much in the same way as formerly, either with the araire or, occasionally, with a deep working plough of more modern type and supplemented by baring the stock with the hoe (*déchaussement*). The second and third ploughings are, however, replaced by scarifyings, varying in number and depth according to circumstances but usually shallow.

From the above it is evident that, in its essential features, the system according to which the soil is worked, has altered little since remote antiquity, when all work was done by hand. It is, in a general way, characterized by a deep winter ploughing, executed as early in the winter as circumstances will permit, serving to aerate the soil and enable it to absorb the late winter rains. This is followed by shallower spring working and a still shallower summer one, which frees the land from weeds and favours retention of moisture.

SHALLOW *versus* DEEP PLOUGHING.

It has long been held, in certain quarters, that deep cultivation is injurious to the vine by cutting the surface roots; the very ones best situated for the absorption of plant food, since this is more abundant near the surface than in the deeper layers of the soil. Basing themselves on this argument, several authorities, among whom may be noted no less a one than Dr. Guyot, recommended shallow cultivation instead of the thorough working described above. It is true that most of the earlier critics of deep cultivation were residents of cool climates, where the moisture problem is vastly different to what it is in northern Victoria. Professor Foex replied to these in 1886 as follows:—*

> In countries where the summer is dry and where deep cultivation is most necessary, the absorbent roots are not usually superficial, because they do not find in the surface layers of soil, the moisture necessary for their healthy development, or because, having formed themselves there, under the influence of spring rains, they die off during the drought of summer. It would, therefore, be only in climates where the soil does not dry out in summer, that it would be advantageous to restrict the depth of ploughing.

The subject has cropped up again recently. Experiments conducted by undoubted authorities in widely different situations in Germany, Northern and Southern France, Spain, and even in Algeria and Tunis, have given results favourable to shallow cultivation. These experiments created quite a sensation some six or seven years ago. Professors Degrully and Ravaz of the Montpellier school published, in 1905, an exhaustive inquiry into

* G. Foex—*Cours Complet de Viticulture*, p. 372.

the question.* Though lengthy quotations are not here possible, their general conclusions may be reproduced.

1. Young vines, from the time of their plantation to the age of three years, should receive good ordinary ploughings. The first roots all originate deeply, and it is of the highest importance to facilitate the aeration of the layers in which they develop.

2. In the case of older vines, experiments have shown, so far, that shallow cultivation is preferable to deep in all compact, moist or medium soils. It must not be forgotten that it is only fully effective when it prevents the growth of weeds. Shallow cultivation has proved equally advantageous in sandy coast lands, very dry on the surface but where the water table is usually found at a shallow depth.

On the other hand, our calculations and experience show that, in dry, pebbly and very porous soils, where the water table is very deep—where, on this account, the roots tend to occupy the deeper layers—deep ploughing remains indicated and should give better results than systematically shallow cultivation.

This necessarily brief reference to an interesting and, as yet, imperfectly elucidated question will, it is hoped, serve as a warning to vine-growers, not to be too readily led to follow the easier way of shallow cultivation, for there can be no doubt that many of the arguments put forward by its advocates are such as would appeal to practical growers, most of whom are only too anxious to find any excuse for economy in working.

The above quotation from Professor Foex, and the last paragraph of M.M. Degrully and Ravaz's conclusions, apply with special force to northern Victoria, which is hotter and drier and in which evaporation is far more active, than near Montpellier.

Systematic deep cultivation will cause the absorbent roots to normally establish themselves at a certain depth. There will then be no surface roots to cut. The drought resistant power of the vine must, naturally, be thus considerably increased.

Another and, to my mind, unanswerable argument in favour of deep cultivation is to be found in the fact that Hérault, where this deep working is the almost invariable rule, is the very part of France—of the whole world in fact—where the vine is made to give its most abundant yields. The proof of the pudding is in the eating!

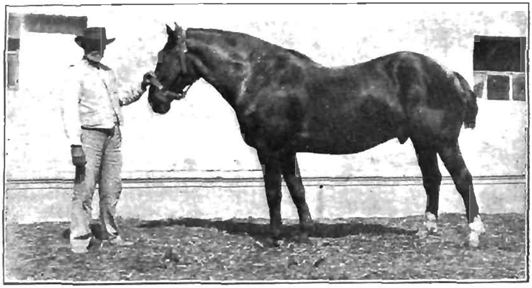
Modifications to Meet Victorian Conditions.

In the opinion of the writer, we may, with advantage, go even further than to merely imitiate Hérault cultural methods. Northern Victoria is hotter and drier than Southern France. This would make it logical for us to advance the date of the first winter ploughing. Such a course would undoubtedly largely increase the store of moisture. Ploughing is often impracticable in the middle of winter. It is therefore left till the ground is in a fit state; but in many seasons the rains cease and the dry weather comes on suddenly, so that the ground which, during the whole winter, has been in such a condition as to allow the rain water to run to waste rather than to be absorbed, dries out rapidly. Thus, deficiency of moisture may lead to a reduced crop even though the rainfall of the year may have been normal.

Why not make the first ploughing precede the winter rains? There are, it is true, some difficulties to be overcome, such as ploughing before pruning; but they are not insuperable and there can be little doubt that the advantages would abundantly compensate any inconvenience. We are generally agreed as to the value of summer scarifying, of keeping the

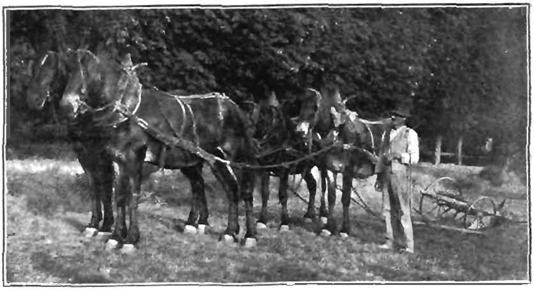
* *Sur la Culture Superficielle de la Vigne.*

vineyard clean and its soil loose. In our best vineyards little improvement is possible in this direction, but as regards depth we certainly have much to learn from Southern France. I feel sure that even earlier ploughing than is the rule there, will, owing to our greater need for studying the conservation of moisture, prove the proper course especially in dry situations.



VINEYARD HORSE—PERCHERON BREED.

A deep ploughing in very early winter would be tantamount to fallowing, which, in the case of cereal crops is now generally recognised as the fundamental basis of our wheat production. The general execution of such a deep, early ploughing would practically mean the application of



TEAM OF MULES AT VERCHANT.

the dry farming methods we hear so much of nowdays, to the cultivation of the vine.

Mules for Vineyard Work.

A Victorian cannot fail to be much struck by the extent to which mules are used for vineyard work in Southern France.

French draught horses are very good, the Government having done a great deal towards their improvement during the past half century. They are of the Percheron breed and especially suitable for vineyard work. Some idea of this compact, active, light draught horse, will be gained from the snap shot reproduced, which represents a good ordinary animal and not a prize taker.

Notwithstanding the quality and suitability of these horses, mules are very generally preferred for vineyard work. They do more work and consume less feed than a horse and can be worked for a longer time without a spell. They are also said to damage the vines less.

On some of the best managed large estates in the region, mules are exclusively used for all vineyard work. Our photograph shows a team in use at Verchant estate which was worth over £250. I was much struck by these fine animals, usually from 16 to 17 hands high, and was led to form quite a different opinion of the much abused mule. These animals are not locally bred, but come usually from Poitou, a district where mule breeding is made a specialty of and where they often command a price of from £70 to £80.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, Principal, School of Horticulture, Burnley.

The Orchard.

It is to be feared that the abnormal weather conditions, the cold temperatures and the wet days, will somewhat interfere with fruit trees and orchard results this season. It will be very interesting to note exactly what the effect of this unusual weather will be. It is hardly within the recollection of growers that similar weather has ever occurred at this time of the year. A large quantity of fruit, particularly any late stone fruits, will be spoiled by the excessive wet; while some mid-season apples and pears will also suffer. Already one effect is noticeable—the blossoming of occasional fruit spurs. Wherever this occurs the blossom should be picked off; no good will result from allowing the fruit to set. The fruit itself would not ripen, being so late, and the regularity of action of the tree will be much interfered with.

PLANTING.

Where new areas are being prepared in anticipation of planting out in the autumn and winter, these rains will be of immense benefit. Ploughing will be greatly accelerated; and, if the land has been already ploughed, the subsoil will receive an excellent soaking.

In preparing land for planting out, and this should be commenced right away, so as to allow the soil to sweeten, it should be subsoiled, so as to produce good results in after years. Subsoiling will add to the age and vigour of the trees, it will materially increase the crop, and it will considerably lessen the expense of fertilizers. Reference has previously been made in these notes to the success attained from growing fruit trees in subsoiled land; but the fact may be again pointed out that many growers in Victoria are to-day reaping the benefit of increased crops without artificial feeding, where the soil was subsoiled before planting. Drainage is another most important factor in successful fruit culture; but while perhaps

drainage may be delayed for a few years, if the other initial expenses are extensive, it must again be emphasized that proper subsoiling cannot be carried out after the trees are planted.

GREEN MANURES.

If a cover crop of leguminous plants is required for green manuring, a start at planting may now be made. This can only be done when all of the fruit has been gathered from the trees. An early crop is a distinct advantage. The cover crop should make good growth before winter sets in, as the plants make very little headway in the cold weather, and they require to be ploughed in as soon as the ground is dry enough in early spring. It will thus be seen that it is necessary to get a good autumn growth, as dense as possible, and one which will well cover the surface before winter

CULTIVATION.

Should the weather become hot and dry, it will be very necessary to give the land surface a good stirring, so as to conserve the great amount of water supplies that the ground received in January and February. Where fruit crops have been gathered, a start may be made, late in the month, with the autumn ploughing; whatever ploughing is done should be left as rough as possible.

CODLIN MOTH.

Where late fruits are grown, or where there is a possibility of late attacks of this pest, a final spraying with arsenate of lead may be given. Reports of the use of chromate of lead in India, in place of arsenate of lead, have been recently published. It is stated that where the Codlin Moth has obtained a foothold in India, it is impossible, owing to climatic influences, to use arsenate of lead, as it burns the trees severely. So chromate of lead is used in its place, reputedly with good results.

On the suggestion of the Chemist for Agriculture, a block was set apart in the Burnley Orchards to test its value and efficiency. The only point in favour of the chromate of lead is the ease with which its presence is noticeable on the foliage and fruit. Wherever sprayed, it leaves bright yellow blotches and spots. Otherwise, its success as an insecticide is absent. In the block sprayed, about an eighth of one orchard, there were more Codlin larvæ infested apples than in the whole of the remaining portions.

PEACH APHIS.

It may appear somewhat early to think of dealing with this pest. But our knowledge of its habits and the necessary sprays to combat it is increasing every year; and it is most apparent that, if the pest is to be attacked with a red oil emulsion, the mixture must be used earlier than hitherto.

It is recognised that one of the easiest and most useful methods of dealing with this pest is to spray the trees in their dormant stage with red oil emulsion. In orchards where, some years ago, half-a-dozen sprayings with a nicotine spray were given, often with very little visible effect, a marvellous change has been effected by the use of red oil in winter. One spraying has been effective in almost clearing out this pest; and where the aphides have reappeared in the spring time, their numbers have been so small, that a light spraying with nicotine solution has been all that is necessary. This applies to both green and black aphis.

Still, the action of red oil has been far from satisfactory, and very great care will need to be exercised in its use. Quite a number of trees have been killed; some have been killed outright, others have made quite a fair foliage growth on the tips in spring, and even then they have succumbed. Various causes have been assigned; the oil being suspected of possessing some caustic properties, or of being possessed of the power of penetrating the cells in the bark and injuring the inner bark and growing wood. There is no doubt, whatever, that free oil on the surface of the mixture, if sprayed on the trees, will undoubtedly kill them. Hence the necessity for a perfect emulsion.

Then, again, the physical condition of the trees may be another cause of destruction. Constitutionally, some trees are weaker than others, owing to many and various causes; also, a tree will surely be weakened by constant and frequent attacks of the pest, year after year. And so, while a strong tree receives no ill effect from a 1 in 30, or 1 in 25, emulsion, a weakened tree, constitutionally or otherwise, will probably succumb.

It seems, however, to be fairly definite, that if peach trees are to be sprayed with red oil emulsion, it must be done when no sap movement is taking place, and when the tree is perfectly dormant. Thus early spraying is advised; and it is almost certain that, with a perfect emulsion, and with spraying, say in May or early June, little or no damage will accrue. Again, spraying before pruning has previously been advised in these notes. It is well known that to spray pruned trees with red oil emulsion before the cuts are thoroughly healed, is to burn the wood and bark at the cuts. More than one instance has been observed where the oil has burned down an unhealed cut, along the limb, for several inches. Various media have been adopted to form a perfect emulsion. Soft soap and caustic soda are the general substances. At the Burnley orchards last winter an excellent emulsion was obtained from resin and caustic soda.

The writer suggested to one of the oil companies that if the oil were denaturated before leaving its ports of shipment, it could enter Australia as a spraying oil only; and would come in free of duty. The cost to the grower would thereby be cheapened. As an experiment the oil was therefore denaturated with 2 lbs. of resin per gallon, and an emulsion obtained by stirring in ½ oz. of caustic soda. The results were excellent; not only was a perfect emulsion made, but the aphis was completely eradicated, no sign of it appearing in the spring. Further, a block of apple trees badly affected with Woolly Aphis that was sprayed with this emulsion was almost entirely freed from the trouble.

It is anticipated, however, that further developments may be expected in red oil emulsions, as one manufacturer will in all probability place on the market a red oil jelly or oil soap similar in appearance to vaseline, which will only need to be stirred into the water, when it will be ready for use. This jelly gives a milky emulsion which, when mixed, and allowed to stand for two or three weeks, has no free oil floating on the surface.

Vegetable Garden.

All vacant plots should be given a liberal surface dressing of stable manure, and then well and deeply dug. For winter growth, the beds should be elevated somewhat above the ordinary summer level. That is, the path surface may be on a lower level, the plot soil being well thrown up and boldly ridged. This will give a certain amount of drainage, and will insure warmer and better soil; the vegetables should succeed more in this class of bed than in any other

The vegetable garden and also the seed beds should be kept free of any weeds, and a good cultivation kept up all through.

Seedlings of cabbage, cauliflower, lettuce, and celery may be transplanted out, and seeds of cabbage, cauliflower, lettuce, early peas, swede turnip, beet, carrot, radish, parsnip, and early onions may be sown.

Flower Garden.

Undrained gardens have suffered very considerably as a result of the January and February rains. Quite a number of plants, especially young shrubs and dahlias, have been killed by the excessive moisture. A start may be made with garden drainage towards the end of the month, so that the plants may survive the winter rains. Last winter a tile drain was carried through one of the rose beds in the Burnley Gardens; its presence is wonderfully apparent in the growth of the rose bushes nearest to the drain. These have increased very much in size and vigour, while bushes away from the drain have put forth very much inferior growth.

Liquid manure should now be given to all growing autumn plants, such as chrysanthemums, dahlias, and roses. Weak solutions are preferable; strong liquid manures will either drive the plant into a great activity resulting in coarseness, or they will kill the tender roots that collect the food supply of the plant. A weekly application of liquid manure will be ample.

All classes of spring-flowering bulbs may now be planted. In bulb planting, the bulbs should not come in contact with any manure. The manure should have been some time previously dug well in, and mixed with the soil, and all heat should have disappeared. If much manure is required it should be placed below the bulb so that the roots may ultimately penetrate to it. Bulbs thrive in sandy soils; and where the soil is heavy, a little sand may be added with advantage. Bulbs should not be planted too deeply; the depth to plant is generally regulated by the size of the bulb. Such bulbs as freesias may be covered with only an inch of soil, while larger bulbs should be somewhat deeper. In the Scilly Isles, off the coast of Cornwall, where immense quantities of bulbs are grown for the English markets, the rule is to plant the bulbs very shallow for flowers; while if bulb divisions or increases are required, the bulb is planted deeper.

All hardy annual, biennial, and perennial seeds may now be planted: among these are dianthus, candytuft, sweet peas, Iceland poppy, anemone, ranunculus, stock, wallflower, columbine, foxglove, salpiglossis, phlox, penstemon, pansy, gaillardia, &c.

Wherever aphis and red spider occur, the plants should be sprayed with benzole emulsion, nicotine, "Pestend," "Soaperine" or some other preventative, in order to protect the coming flowers.

Mildew attacks should also be warded off by the use of sulphur. The sulphur may either be dusted on the plant, or it may be scattered on the ground, around and under the plant.

ANNUAL GRANT TO AGRICULTURAL SOCIETIES.

CONDITIONS TO BE CARRIED OUT BY AGRICULTURAL SOCIETIES RECEIVING A GRANT.

A.—That the awards of prizes in all classes for stallions three years old and over at the Society's Show must be subject to the possession by the exhibit of a Government certificate of soundness.

B.—That the Society arrange for:—

(1) The holding of agricultural students' classes; or

(2) The holding of a series of at least four lectures or demonstrations on agricultural or live stock matters.*

C.—That the Society—

(1) arrange for the carrying out of field experiments on an area and in a locality to be approved by the Department; or

(2) provide and offer a substantial prize (the amount to be approved by the Minister of Agriculture, but not less than five pounds) for improvements in farm practice and management, or the cultivation of special crops in the district.

As regards A.

Stallion Inspection Parades will be held at different centres throughout the State prior to the commencement of the Show season (Time Table of Stallion Parades for 1911 will be available shortly after 1st April, 1911). The parade centres are so arranged that all owners of Show stallions have the opportunity of submitting them for examination for the Government Certificate of Soundness before the closing of entries for the Show. Show Secretaries will require to obtain evidence of the possession of the Government Certificate in respect of exhibits at the time of entry, and should not accept entries of other than certificated horses.

Immediately after the Show, Secretaries of Societies are required to forward the names *of all the horses* that have won the prizes in stallion classes, together with the names of the owners, to the Director of Agriculture.

As regards B.

B.1.—AGRICULTURAL CLASSES.

Applications must be submitted not later than 1st April, 1911.

The agricultural classes will extend over two weeks, five days a week, a demonstration being given each morning and afternoon, and four limelight lectures on evenings to be arranged for by the Secretary of each Society. Thirty students at least must be enrolled before a class can be held. The rent of hall and all local charges are to be paid by the Agricultural Society; all other expenses by the Department. Arrangements must be made to insure the uninterrupted use of the hall during the time the lectures are going on.

A roll of attendances at lectures and demonstrations shall be kept.

At the conclusion of each class, a written examination of about 1½ hours duration will be held, a medal to be awarded by the Department to the student in each district obtaining the highest number of marks for examination work and regular attendance combined. Two-thirds of the

* Societies to select subjects (page 212) and notify Department not later than 1st April, 1911.

maximum marks obtainable will be given for examination work, and one-third for regular attendance. The Department reserves the right to withdraw the offer of the medals in the event of there being less than five students remaining for examination.

A special examination for the Gold Medal offered by the Australian Natives' Association will be held and only winners of Departmental medals will be eligible to compete thereat.

Subjects of First Week.

Agriculture.
Live Stock and Veterinary Science.

Subjects of Second Week.

Two or more of the following, to be selected:—(*a*) Sheep Breeding and Management (including Wool Classing and Lambs for Export); (*b*) Dairy Farming (including Management and Breeding of Pigs); (*c*) Poultry Breeding and Management; (*d*) Orchard and Garden Work.

B.2.—LECTURES.

Agricultural and Live Stock Subjects.

The course will consist of at least four lectures or practical demonstrations during the year (dates to be fixed by the Department); **and the Society must take sufficient interest in the matter to insure a good attendance,** otherwise the lectures will not count for the grant conditions.

Many of the lectures are illustrated by limelight views.

SPECIAL NOTICE.

All dates of lectures will be fixed by the Department. A list of the subjects and lectures is published herewith. Each Society must select its subjects, and notify the Department of same not later than *1st April*, as the dates for lectures will be fixed immediately thereafter. If Societies will state the most suitable seasons for their districts, the lectures will, as far as possible, be arranged accordingly.

The Department will recognise any suitable lecture, paper, or address that a Society may arrange to have delivered by any person other than a Departmental officer, and such lecture will count as one of the four required, provided due notification prior to delivery of lecture is given, and the President of the Society afterwards certifies as to *bona fides* and suitability of the lecture.

As regards C.

C.1.—EXPERIMENTAL PLOTS.

The plot of land should be about 5 acres in extent, so that the amount of produce may be of value to the Society. It is desirable also that arrangements be made for the use of the land for a number of years, so that a definite scheme can be worked out; the Society to furnish the land, with a written guarantee from the owner that it will be available free of charge to the Department. The Department will supply the manures and the seed free of cost, and superintend the sowing and harvesting, two-thirds of the produce to belong to the Society, and one-third to the Department.

(*a*) No site shall be approved until reported upon by an officer of the Department.

(*b*) No person whose farm equipment of teams and implements is insufficient, or out of date, shall be accepted as a proper person to conduct an experiment.

(*c*) The preparation of the land shall be wholly carried out by the experimenter, and, if not considered in proper order at the time of sowing, any further work desired shall be done promptly.

(*d*) Every Society shall appoint a sub-committee to consult with the Departmental officer, as to the class of experiment and the best means of carrying out the same.

(*e*) Every Society shall arrange for regular visitation of the experimental plot during growth and for a "field day" and lecture upon the plot towards its maturity.

It is suggested that one or more experimental plots should be developed in each district. Three main lines of investigation may be carried out; first, the determination of the manurial requirements of the district; second, the introduction of new methods of management and of new crops; third, by introducing new varieties of crops not already grown in the district. The area of land selected should be typical of the district, if anything, rather on the poor side. The location of the plot should be such that it can be seen by as many farmers as possible. An area adjacent to the principal town, or close to the railway station of the district, is therefore suggested. The details of the experimental work carried on by the Department are published from time to time in the *Journal*.

C.2.—SPECIAL PRIZE.

In carrying out this section, the words, "substantial prize" are to be interpreted in proportion of the income and prize list of the Society. It should amount to from 2½ to 5 per cent. of the total amount distributed in prizes at the show. The objects aimed at should be to make a distinct advance in farming methods as carried on in the district, and it will therefore be advisable to state the amount of the prize and the purpose for which it will be awarded several years in advance. Several Societies at present award prizes for the best-managed farms under and over 200 acres; others for the best farm under irrigation. These Societies fulfil all the conditions required. Suitable subjects are—(*a*) The best 10 acres irrigated by a private scheme; (*b*) The best 5 acres of lucerne, maize, or other fodder crops grown with or without irrigation; (*c*) The best-managed dairy herd of ten cows or upwards: or (*d*) The best 5-acre crop of flax or beans, &c., &c. Two or three objects should be suggested by each Society in taking up this condition. The Department will, as far as possible, assist by arranging the details of the competition, give instruction as to the best methods in attaining the object sought, and, if required, an officer of the Department will judge the competition, and a full report, with criticisms and suggestions for improvement, will be forwarded along with the award.

(*a*) The Society shall take steps to make the details of the competition widely known, and shall fix a date upon which entries close.

(*b*) Not less than three entries shall constitute a competition.

(*c*) If the entries are insufficient, the Society shall immediately notify the Department, and make other arrangements at once to comply with the grant conditions.

SYNOPSIS OF LECTURES AND DEMONSTRATIONS.

Principles of Agriculture.

1. The plant food of the soil.
2. Cultivation methods and management.
3. Principles of manuring.
4. Valuation of artificial manures.
5. The management of the farm.
6. Special crops and catch crops.
7. Irrigation principles and methods.

Veterinary Science and Live Stock Subjects.

1. The structure and care of the horse's foot (lantern).
2. Brood mares and breeding mishaps (lantern).
3. Colic, constipation, and other bowel complaints.
4. Ailments of dairy cows—milk fever, impaction, udder complaints.
5. Contagious diseases of stock—abortion, blackleg, tuberculosis, anthrax, pleuro pneumonia, &c.
6. Ailments of swine, or ailments of sheep.
7. Unsoundness in horses (lantern).
8. Principles of stock breeding—stud horses.

Sheep Breeding and Management.

1. The breeding of sheep for wool.
2. Australian and British breeds of sheep.
3. Crossbred ewes *v.* merinos.
4. Raising fat lambs (whitefaced *v.* blackfaced breeds).
5. Management of flocks.

Dairy Farming.

1. Breeding and management.
2. Dairy buildings.
3. Dairy management.
4. Milk and cream testing.
5. Foods and feeding.
6. Pig breeding, feeding, and management.

Poultry Breeding and Management.

1. The poultry industry: its importance. Locality—suitability or otherwise.
2. Housing (construction of, materials, insect proof, aspect, &c.). How to select stock.
3. Breeds: payable or otherwise, eggs and table. Breeds adapted for export—modes of crossing.
4. Turkeys: their care and management. Chicken raising and care.
5. Foods and feeding demonstrated.
6. Common ailments of poultry. Incubation—natural and artificial.

Orchard and Garden Work.

1. Fruit growing—Varieties suitable to the different localities, soils and sites.
2. Preparation of land—Planting and pruning.
3. Cultivation—Manuring and management.
4. Insect pests and fungus diseases and their treatment.

Viticulture.

1. Phylloxera and resistant stocks—Preparation of land.
2. Propagation and grafting—Best varieties to grow.
3. Pruning and seasonable operations.
4. Wine-making and cellar management.
5. Drying raisins, sultanas and currants—Packing fresh grapes for export.
7. Vine diseases and treatment.

Potato Culture.

1. The soil and its cultivation—Care of the growing crop, manures.
2. Seed and its selection—Keeping of seed potatoes.
3. Diseases and their treatment.

Subjects and Staff.

Principles of Agriculture—Special Agricultural Lecturer: Mr. Temple Smith.

Veterinary Science, Stock Management, Dairy Sanitation and Education—Messrs. Robertson, Kendall, Griffin, Strong, Cother, and Johnstone.

Special Veterinary Lecturer—Mr. C. D. Strong, G.M.V.C.

Dairying Industry and Export Trade—Messrs. Crowe, Archer, and Carroll.

Orchard and Garden Work—Messrs. Carmody and Pescott.

Sheep Breeding and Management—Mr. H. W. Ham.

Viticulture—Mr. F. de Castella.

Flax Culture and Demonstrations at Shows—Mr. Knight and staff.

Poultry Breeding and Management—Mr. H. V. Hawkins.

Poultry Dressing Demonstrations—Mr. A. Hart.

Potato Culture—Mr. G. Seymour.

Tobacco Culture—Mr. Temple Smith.

Pig Breeding and Management—Mr. W. Smith.

Fruit Industries—Mr. J. G. Turner.

Insect Pests—Mr. C. French. Junr.

Plant Diseases—Mr. D. McAlpine.

Irrigation—Expert of State Rivers and Water Supply Commission.

ANSWERS TO CORRESPONDENTS.

The Staff of the Department has been organized to a large extent for the purpose of giving information to farmers. Questions in every branch of agriculture are gladly answered. Write a short letter, giving as full particulars as possible, of your local conditions, and state precisely what it is that you want to know. ***All inquiries forwarded to the Editor must be accompanied by the name and address of the writer.*** This is very necessary, as sometimes insufficient information is furnished by the inquirer.

Death of Young Pigs.—B.G.F. inquires as to likely cause of death of young pigs. He states that two litters did splendidly for the first week, and then got the scours, all (15) dying within two or three days.

Answer.—Keep the sties and feeding utensils scrupulously clean, and see that the sows are not fed on anything likely to cause intestinal derangement. Young pigs are very susceptible to insanitary conditions, inducing a form of ptomaine poisoning.

Pig Lice.—C.J.M. inquires as to best method of ridding pigs of lice.

Answer.—Washing with a solution of washing soda and afterwards applying an oil with a brush is an effective way of destroying them. This should be repeated at weekly intervals. Another effective dressing is a shampoo made by mixing a half-pound of powdered Stavesacre seeds, 1 lb. of soft soap, and one gallon of water. Allow it to simmer gently over a slow fire until the quantity is reduced to half-a-gallon; and when cool apply as a shampoo.

KIDNEY WORMS IN PIGS.—M.W. asks how to treat pigs suffering from kidney worms.

Answer.—Give the following:—Oil of turpentine, 2 drachms; raw linseed oil, 2 ounces.

FISTULA.—L.B. states that a mare of his has a swelling on the rump, about 2 inches from the fundament. It first appeared as a soft swelling which, after being fomented, discharged a thick slaty-coloured fluid; a channel in the wound leading up to within an inch of the bone of the base of the tail. After a while the discharge ceased and the wound healed, but a small hard core appeared under the skin. It has broken out higher up, and the hardness is increasing in size.

Answer.—The swelling is probably the result of an injury to the bone, causing the formation of a fistula. A surgical operation to remove the diseased bone will be necessary. In the meantime, open swelling and syringe with a corrosive sublimate solution—one part of sublimate to 500 parts of water.

INDIGESTION.—W.M.W. writes that a 3-year old filly is, he thinks, suffering from worms or bots. She is fat, bright in coat, and looks well, but about every three days she lies down and gets up, seems very uneasy, and stands with head straight out, lips drawn back, ears set back, and tail constantly moving. After an hour or two she gets right and feeds quietly.

Answer.—The filly's behaviour is probably caused by some digestive trouble. You are advised to administer the following drench:—Oil of turpentine, 1 ounce; raw linseed oil, 1 pint; being careful that none of it is allowed to enter the lungs. Lower the head on coughing or slightest sign of difficulty in breathing.

STOMACH WORMS.—F.S. states that a mare, stinted about two months, is suffering from worms and is losing condition. He asks whether it would be safe to give her a drench.

Answer.—You do not state what kind of drench you intend to give, but one of linseed oil, 1 pint, and turpentine, 1 oz., would not be injurious.

BLINDNESS (MARE).—W.R.N. states that a 7-year old mare has gone blind in both eyes. There is a slight swelling around the eyes and a lot of watery discharge. The mare is being kept in a darkened stable, with a bandage over her eyes during the daytime.

Answer.—Ophthalmia is evidently the affection possibly caused by foreign bodies, such as grass seeds, in the eye. If so, remove, and use the following lotion, dropping 3 or 4 drops into the eye three times a day:—Sulphate of zinc, 2 grains; tincture of opium, 20 drops; water, 1 ounce. Keep the animal in a dark box and a bandage over the eyes kept wet all day with a lotion of boracic acid.

ILLNESS AFTER CALVING.—W.M.A. writes:—"I have a cow (on her third calf) which gave 4 gallons for the first two weeks after calving. She then began to lose her appetite, refused skim milk, and eats little grass or hand feed; has got into low condition, seems dull, and now gives but 1½ gallons."

Answer.—Your cow probably did not "clean" after calving. The absorption from contained material would account for her present condition. If there is any discharge or uncleanness about the bearing, syringe well with 1 per cent. Lysol solution and give the following drench:—Epsom salts, 1 lb.; treacle, 1 lb.; ground ginger, ½ oz.; sulphur, 1 oz.; in quart of water. Follow with ½ oz. of ginger and ½ oz. of Gentian in a bottle of warm beer which may be given every day. The milk should not be used until recovery takes place.

RETENTION OF FOAL.—P.J.P. gives particulars regarding a pony mare which was served 14 months prior to writing. The udder is small, but filled with a watery fluid (sample forwarded); a lump exists between the udder and the navel which is hard, the milk "vein" is prominent, with a few dry flakes of skin leaving it. It has the appearance of an old outbreak of large pimples. The vagina contains a small discharge of white liquid. The conclusion arrived at is that it is abortion or that the foal is dead and still retained.

Answer.—It is possible the foal is dead and retained; though, with a careful examination, you should be able to definitely ascertain this. The theory of abortion is also feasible. There has evidently been a mild mammitis, as shown by the sample forwarded. Stripping the udder and rubbing with camphorated oil should correct this. Possibly the swelling in front of udder will develop into an abscess, and require lancing and syringing out. Should the foal be retained, the services of a veterinary surgeon should be obtained.

TEAT DILATION.—A.L.O. asks whether there is a method of making a stiff milker easy. He has a 2-year old heifer, which promises to be a very good cow, but is very hard to milk.

Answer.—There is no infallible way of doing so. The instrument known as a Teat-dilator may be of service, but its use by the layman cannot be commended. A simpler method would be to massage with castor oil, which, at times, is efficacious.

BLINDNESS (SHEEP).—J.R.C. and J.M.C. state some of their sheep are getting blind, a film coming over the eyes.

Answer.—The most common cause of this condition of blindness at this time of the year is the entrance of grass seeds into the eyes which pass well under the lid, and have to be carefully searched for and removed. The resulting inflammation is best treated by washing with boracic acid lotion, and dropping a few drops of the following into the eye twice a day or as frequently as the number affected will allow :—Boric acid, 4 grains; tincture of opium, 20 minims; sulphate of zinc, 1 grain; water, 1 oz. Specific Ophthalmia may also be considered, but similar treatment is effective.

SHEEP AND CATTLE LICK.—W.T.C., whose land is almost wholly granite-sand country, asks whether it is advisable to mix lime with salt as a sheep lick.

Answer.—A sheep and cattle lick composed of lime, 6 lbs.; superphosphate, 6 lbs.; and salt, ½ cwt.; is a suitable one for the country described.

POULTRY—TABLE BREEDS.—G.T. inquires *re* best breeds of fowls to select for crossing for table purposes.

Answer.—The following breeds are suitable for local and export trade :— Dorking and Game cross, Buff or White Orpington and Game cross, Wyandotte and Dorking cross; or Faverolles, Black Orpingtons or any of those mentioned bred pure.

FEEDING FOR EGG PRODUCTION.—H.H.H. asks what would be the proportion of protein, &c., in a perfect food for laying hens.

Answer.—In feeding hens for egg production they require a narrower ration than other farm animals, *i.e.*, 1 of protein to 5 of carbo-hydrates, &c. Roughly speaking, this is equal to 1 oz. animal food and 1½ ozs. pollard and bran, with one-third of the bulk made up of lucerne chaff. The feeding to each bird of about 2½ ozs. each morning and 1½ ozs. of grain each night—equal parts wheat and short white oats—is recommended.

CASTRATION OF RAM LAMBS.—J.R.C. asks whether lambs bred for export should be castrated.

Answer.—The younger they are when they are operated on the less it will check them. If they are not castrated, the fact of the testicles being in could be used against you with a view to lowering the price of the lambs. Again, during some seasons, even providing you do your best, there will be rejects—they must then be castrated with, perhaps, some losses.

"NITRO-BACTERINE."—C.A.H. desires information as to effect of treating lucerne seed with "Nitro-Bacterine" and similar cultures.

Answer.—The use of these preparations for inoculating lucerne is not recommended, except under very unusual circumstances. Most Australian soils suitable for growing lucerne already contain a sufficiency of the bacteria required, and experiments at Burnley carried out by the Department have shown that, in such cases, the treatment of the seed with bacterium cultures, if anything, tends to decrease the yield. Where lucerne refuses to grow, it should be made sure that this is not due to bad drainage, a deficiency of lime, or the presence of injurious materials in the soil. If it is due to the absence of the requisite bacteria, these are best added by sprinkling over the ground soil freshly removed from old lucerne fields. A cart load of such soil, say at 10s., will add at least a thousand times as many suitable bacteria to the soil as an ordinary imported culture at the same price. In addition, the bacteria developed in cultures seem to disappear rapidly in the soil if it is at all unsuitable for them.

CODLIN MOTH.—W.J.E. asks if one can tell whether Codlin Moth is prevalent in an orchard.

Answer.—The eggs of the Codlin moth can be seen on fruit or leaves. If hatched, the presence of the grubs becomes evident through the excreta expelled from the tunnel made in the fruit.

SLATERS.—W.J.E. inquires *re* treatment of posts which are being eaten by slaters.

Answer.—Paint posts with arsenate of lead and whiting paste—1 lb. of arsenate of lead to 9 lbs. of whiting, made up into a paste with water.

SPRAY PUMP.—W.J.E. writes :—"I have a spray pump that works in a bucket. How should it be cleaned? Should it be oiled? I once screwed the top off and took out the piston. When I put it back I am afraid that I injured the leather portion, for much of the spray mixture works over it now."

Answer.—It is impossible to say how your pump should be cleaned without an examination. Unscrew all the parts that you can and use strong washing soda wash, then oil or use vaseline. It requires a new leather washer.

TARRING.—A.S.O. asks for particulars as to correct mixing, and condition of tar, to make a suitable paint for yards, so as to avoid melting, sticking, or flaking. He also asks for quantities of tar and pitch for making a mixture that will not melt with heat.

Answer.—The tar should be brought to the boil and applied hot. The material which is to be coated should also be as hot as possible and perfectly dry; therefore a hot day should be chosen for the work. Two pounds weight of pitch to ten gallons of tar makes a good mixture.

CLEANSING UNDERGROUND TANK.—W.J.E. states that last season the water in his cement underground tank became foul—the cow would hardly drink it. It is covered loosely with boards.

Answer.—Waters collected and stored in underground tanks, more especially those conducted from roofs, are very liable to become foul through decomposition of organic matter which is washed into the tank by the water. The tank should therefore be thoroughly cleansed periodically by washing, preferably with lime water. If possible, the tank should be left uncovered.

RESTORING FERTILITY TO SOIL.—V.W. writes:—"Some two years ago flood waters from the surroundings of the local cyanide and metallurgical works went over some of the flats, and now the crops will not grow on the portions affected. Can you state a method of restoring fertility?"

Answer.—If deleterious matter had been deposited on the land from the source mentioned, it would, by this time, have leached out by the action of rain and drainage. An analysis of the soil would be necessary to reveal the cause of the trouble. A leaflet stating how samples of soil should be gathered for chemical analysis may be obtained on application to the Secretary for Agriculture, Melbourne.

PREVENTION OF SWARMING.—D.E. asks how to prevent bees from swarming. He is keeping the queen in the top super with the excluder so as to prevent her from coming down.

Answer.—Confining the queen bee to an upper storey to prevent swarming has some serious drawbacks. Even when full sheets of foundation have been used in the frames, there are always some drone cells on brood combs; and, when an excluder is inserted below the brood, the drones which are nearest cannot get out of the hive. They get stuck in the excluder, die there, and block the passage way for the workers. If an opening is made, so that they can fly from the upper storey, the queen can also escape if inclined to swarm. Also, worker bees will strip most of the pollen off their legs when getting through the excluder. Bees will not, as a rule, store honey below brood; and, when the brood in the lower chamber has hatched out after the queen is put in the super, the lower combs will be neglected.

RAPID GRANULATION OF HONEY.—D.E. states that he is having difficulty with the honey. As soon as it is robbed it becomes frozen.

Answer.—The rapid granulation of the honey is due to its composition. Of the two principal components of honey, dextrose and levulose, the former when predominating causes the candying or granulation. Heating the honey to 160 degrees (Fahr.), by standing the tins in water over a fire, will reliquify it. There should be a space of at least half-an-inch between the bottom of the honey tin and the vessel containing the water; on no account should 160 degrees be exceeded, otherwise the honey will be spoilt.

LIFE OF QUEEN BEE.—D.E. inquires as to life of queen bee.

Answer.—The life of a queen bee is from two to three years. An old queen is replaced with a young one by the workers when she begins to fail; that is, when the eggs contained in her ovaries are nearly all laid. When bees are in a state of Nature the laying of the queen is restricted to the combs built by the workers, and she may therefore last four years.

LOSS OF BEES.—I.J.B states that several of his hives which have not been robbed for twelve months are quite empty and all of the bees have perished.

Answer.—Without fuller information it is not possible to say what caused the loss of the bees. They may have succumbed to disease, or lost their queen, swarmed and absconded, or died of starvation. Which of these was the cause could only be determined by an inspection of the hives.

TEXT-BOOKS ON APICULTURE.—I.J.B. asks for the names of text-books on apiculture.

Answer.—The best standard work on bees is Root's *A.B.C. of Bee Culture.* Price (including postage), 7s. There is a smaller book which may answer your requirements: *The Australasian Bee Manual*, by J. Hopkins. Price (with postage), 2s. 8d. Both books are obtainable at Messrs. W. J. & F. Barnes, Albert-street, East Melbourne, and also from leading booksellers.

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OF

The Department of Agriculture

OF

VICTORIA.

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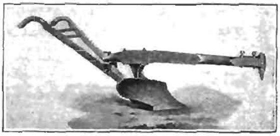
IRRIGATION.

(Continued from page 125.)

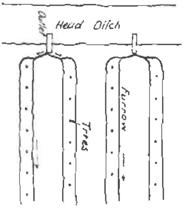
G. H. Tolley, Manager, Wyuna Irrigation Farm.

WATERING.

It will be pertinent now to consider methods of laying out paddocks to secure effective watering. The simplest and easiest form of watering is by means of furrows, and is chiefly used for orchards, but the following remarks will apply equally to any case of furrow irrigation. In newly-planted orchards, a furrow on either side of and close to the trees is made with a light orchard plough such as an "Oliver No. 13" or "Planet Junior"; connections to the outlet boxes being made with a shovel. In the early stages, a small supply of water will suffice, and the furrows may be connected to the head ditch as in No. 63. Later on, when the trees are well grown, an outlet to each furrow may be necessary. Should any one furrow be receiving too much or too little water, remedy it by steadying the full furrow with a clod of earth or a bunch of weeds; a little practice will soon result in a fairly even flow in all the furrows. As the water gets towards the ends of the furrows, steady it at the inlet pipe so that a proper saturation may be secured without flooding the lower end of the paddock. It will be noticed that a good many clods lie along the furrows; and their presence serves generally to assist saturation, especially in soils with low seepage qualities such as clayey loams. In such soils it is preferable to do the watering slowly; that is, with half the allotted quantity of water,

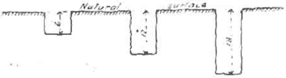


62. "OLIVER" PLOUGH.



63. FURROW IRRIGATION.

keeping it flowing for forty-eight hours, whereas in sandy soils the full quantity would complete the work in twenty-four hours or less. A good method of ascertaining the percolation qualities of soils is to sink a series of holes varying from 6 inches to 18 inches or more at short distances apart and fill them with water. The depth of the holes will be governed by the character of the soil and subsoil, and the time taken for the water to disappear will serve as a guide.



64. TESTING SOIL FOR PERCOLATION.

After filling with water, cover the holes to reduce evaporation losses. In the majority of cases of Goulburn Valley land, a 6-inch hole would just reach or slightly penetrate the subsoil and a good idea will be given of the adaptability of the surface soil for irrigation, while the deeper holes will similarly test the subsoil. The extremes of absorption will necessarily lie between clay and sand, but it has yet to be determined where, within those limits, the medial line shall be fixed. Where other physical conditions obtain, such as in the sand ridges of the Mallee, the holes will of course be made deeper and each particular district will have its separate co-efficient. As irrigation is practised in the warm months of the season, experiments should be made in similar conditions. If made after saturation by rain or irrigation they will be valueless.

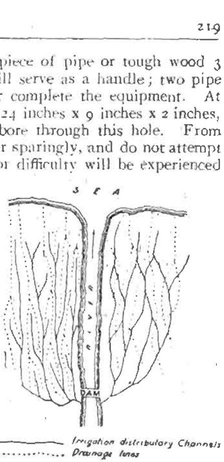
Another point that has yet to be investigated is the effect on irrigated soils of continuous watering. Analyses should be systematically undertaken at varying intervals between successive waterings to determine the extent and duration of saturation, and, if synchronous analyses are made of unirrigated soils, reliable data for future guidance will be obtained and standardization will be possible.

65. BORING AUGER.

It may be of interest to some to point out some easy and inexpensive means by which lower strata may be investigated. Apart from analytical value, a ready means will be furnished of fixing sites for dams, tanks, foundations, &c., without the expense of first sinking trial shafts. The simplest tool is a *probe*, and is applicable only to soft soils easily penetrated. It consists of any convenient length of, say ¾-inch piping, fitted at one end with a spike made to screw into the socket. It is operated by merely "jumping" and it is surprising how deep it may be made to enter. It cannot bring up samples, but rock or other bottom is easily located. Another means of investigation is by boring. A cheap set of boring tools may be made from ¾-inch pipe and a 2-inch carpenter's auger, with which depths of at least 50 feet may often be attained and samples of the strata traversed, secured. Cut the stem of the auger at the point marked A, and "upset" the cut ends sufficiently to take the same thread as ¾-inch piping. Bore a hole in the "worm," where shown, and cut away a V-shaped piece at the end leaving it as in No. 66. Draw the points out and temper so that they project ⅛-inch beyond the straight of the barrel, forming what is known as a "swallow tail," the object being to secure a good cutting edge and give clearance to the auger. Use similar piping for boring rods and have short lengths of 2 feet, 4 feet, and 6 feet for con-

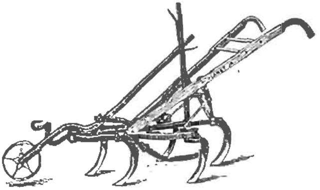
66. CUTTING END OF AUGER.

venience, in addition to longer lengths. A piece of pipe or tough wood 3 feet long shipped in the eye of the auger will serve as a handle; two pipe wrenches, a can of oil, and a can of water complete the equipment. At the site to be bored, fix a piece of hardwood 24 inches x 9 inches x 2 inches, having a 3-inch hole cut in its centre, and bore through this hole. From time to time, as the bore progresses, add water sparingly, and do not attempt to bore more than about 6 inches at a time, or difficulty will be experienced in withdrawing the rods. If the rods do stick, care must be exercised in reversing the auger or it may unscrew from the rods and be lost. If moderate reversing does not effect the purpose, ship a lever or jack under the handle and try a direct lift. Keep all joints well oiled. Chalk marks on the rods will assist in regulating the amount of each "bite." Samples from the bore are conveniently kept in a shallow trench on the surface, made V shaped and about 3 inches deep with pegs along its edge every 6 inches or 12 inches, the length of the trench corresponding with the depth of the bore.



67. DRAINAGE METHODS.

If it is found impossible to water without flooding the lower end of the paddock, in the absence of any provision for drainage, it is good practice to establish a lucerne plot there to take the overflow. Drainage is the inseparable corollary of irrigation, and too frequently little or no attention is paid to it either by the State or the individual. It is as important to get water off land as on it, and though it may be costly it must be faced sooner or later, or much valuable land will be ruined along with the owner. The Goulburn Valley lends itself admirably to effective drainage, being intersected at frequent intervals by dry watercourses, mostly trending in a north-westerly direction towards the rivers. At Mildura, there is no such favourable condition, and resort is had to underground tile drains, leading eventually to wells sunk to permeable strata. Some further remarks on drainage will appear later. A good illustration of the meaning of effective drainage is afforded by the accompanying drawing copied from the *Encyclopædia Britannica* (No. 67). The left portion of the diagram shows irrigation properly combined with drainage, whilst the right is laid out regardless of drainage required later.



68. ORCHARD CULTIVATOR.

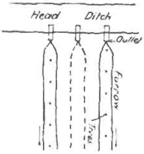
Great care is necessary in watching the effects of water for successive years and endeavouring to prevent a state of saturation; it can much more easily be achieved than avoided, and once achieved it is no child's play

to correct it. After watering, and as soon as the land will bear a horse, close the furrows in with an orchard cultivator, and stir the whole surface of the orchard lightly, assuming it to be free of weeds and trash. Use the hoe freely round the trees, but not severely, especially with citrus trees, the roots of which are close to the surface. Be careful when watering not to allow water to come into contact with the stems of the trees; if the soil around them is kept well stirred, the water from the furrows will soak all through the roots. Contact with the stem is a frequent cause of disease and death.

As the trees grow larger, the furrows are kept further away in order to avoid injuring roots and growing limbs with the implements and horses. The number of irrigations during the growing period depends very much on the character of the season, but intervals of from four to six weeks may be taken as a general average. As one becomes familiar with the growth and habit of trees, he will be able to tell at a glance by their appearance whether or not water is required, and when such indications are present no time should be lost. It is essential in setting out an orchard that the various kinds of trees be kept separate; some require water more frequently than and at different periods to others, and market requirements are more easily met. Should the soil be at all stiff it will take some time for water to seep from furrow to furrow, a condition which should be aimed at and which is a good indication of effective watering. To assist in attaining that condition it is a good plan to connect the furrows transversely at the tree, as shown by dotted lines in No. 69. This may be done with a hoe or shovel, or transverse furrows may be ploughed out *before* ploughing irrigating furrows.

69. WATERING TREES.

There is some difference of opinion amongst orchardists as to whether the furrows should be ploughed to or from the tree; I almost invariably practice the latter. Should the soil of an orchard be very dry it is a good plan to introduce extra furrows between the irrigating furrows as in No. 70. It must be borne in mind that, unless thorough cultivation follows immediately upon a watering, the latter might almost as well have been let alone. Constant and thorough cultivation will result in less irrigation being required, a consideration that will appeal to those who have to pay for each separate watering, while at the same time the trees will be kept in a far better condition of growth, in which state they are better able to resist disease. Where an orchard is of such length that furrows are required to carry water long distances, those trees nearest the head ditch will be over-soaked, while those at the further end may go short. It is a good plan to introduce secondary head ditches, which may be temporary or permanent, and it will be found that watering is expedited and is more effective.



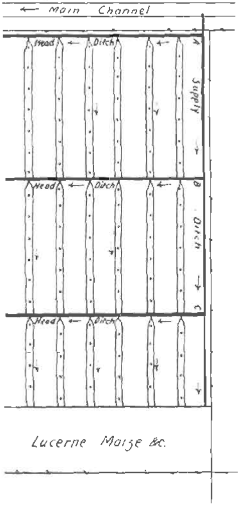
70. FURROW IRRIGATION. EXTRA FURROWS.

The following plan (No. 71) will give a general idea of the proposal; modifications to suit individual conditions will soon suggest themselves.

Dots represent trees, furrows for irrigation being shown on either side of them. There are three head ditches deriving their water from a supply ditch which must be fitted at A, B and C with some kind of

regulators. These ditches will be spaced to suit particular cases, but from 5 to 8 chains may be taken as a guide Arrows show the direction of flow of water. When regulating the water, provision should be made for allowing surplus water (if any) from the furrows fed by the head ditch at A to escape into the ditch at B, and similarly from B to C and from C to the lucerne or whatever else may be there planted. In the absence of lucerne, a waste ditch should be provided, but experience will result in waste being reduced to a minimum. Accidents will happen, especially during the night, when, even if one stays up all the time, breaks in ditches are often not seen immediately.

Once water is turned in for irrigating there should be no stopping until the field is finished. There are, unfortunately, quite a few irrigators who strain every nerve to avoid night watering, when, as a matter of fact, watering is more effectually done then than by day. No excuse for such a practice is permissible. The hardship (?) is not very great in the case of an orchard which will probably be irrigated four, or at most, five times in a season, and it saves waste and loss of time consequent on having to run water again over the previously wetted area. It is good practice to somewhat reduce the supply from the main channel during the night, when flushes are likely to occur without being immediately noticed. The experience gained in watering an orchard a few times will enable an irrigator to so regulate his supply that he can turn in without any anxiety, or, at the worst, lose but very little sleep. Irrigating is an art, and practice alone will acquire it.



71. ORCHARD IRRIGATION. SECONDARY HEAD DITCHES.

In farming districts, water is mostly used to flood pastures, areas for ploughing, or summer crops. The preparation for this in respect of head ditches, outlets, &c., is similar to that described for orchard work, and the practice is alike except that there are no furrows. Assuming the land to be satisfactorily graded, all that remains to be done is to so regulate the flow from the outlets that an even film of water may spread over the surface. The duration of flow will be governed mainly by the profile of the land, and the character and condition of the soil. It should be borne in mind that slow watering is essential on steep slopes, and fast watering on sandy soils and flat surfaces; great care should be taken that water is not allowed to lodge in places for any length of time, free outlet being given to drainage channels. Where there are no drainage channels it will depend largely on the skill of the irrigator to avoid creating swamps. While irrigating, keep the water flowing. Dead water means dead plants, and nothing looks worse than an irrigated paddock studded with bare patches or swamps, apart from waste of land which is the serious consideration.

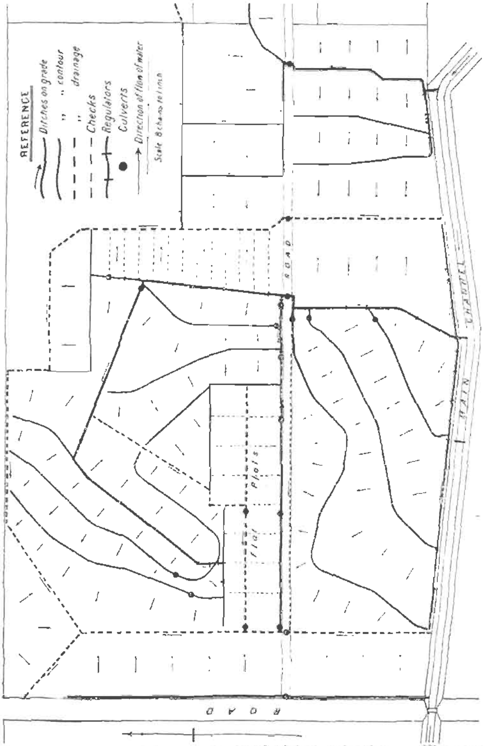
So long as flow is maintained, it is usually a matter of indifference what the temperature of the air is; though, in flat land and places where water is apt to hang, choose cool or cloudy days, or nights for preference. I have often been assured by farmers that it is absolute ruin to lucerne to water it when thermometer readings are high, but I do it with impunity, and am satisfied that, in most cases where bad results have followed, it is due either to want of, or imperfect grading, bad arrangement of the land for watering, keeping water standing too long, or want of provision for drainage. The individual can hardly be held to blame for the latter as it should be provided by the authority responsible for the scheme of irrigation; the other faults are avoidable and curable. It is a *mistake to endeavour to water large compact tracts*; they should be cut up into convenient sizes by means of check banks and subsidiary ditches. A plan of the subdivision of the area sown to lucerne on part

72. WATERING YOUNG TREES, WYUNA IRRIGATION FARM.

of the Wyuna Irrigation Farm is given on the opposite page. It is not presented as being an ideal arrangement, though it works well in practice, but to serve to illustrate the method of dividing a paddock into small areas, keeping the water moving and discharging surplus into drainage channels.

It will be noticed that the distance between ditches ranges from 2 to 6 chains, averaging about 3 chains, while a small area of flat land is divided by a series of checks into ½ acre blocks. One of the advantages of this system is that fairly equal areas for grazing may be fenced off in such a manner as will suit the scheme of watering, and that by the time the last block is grazed and ready for its next watering, the first block is ready for use again. Or any particular plot may be saved, and the produce gathered for hay or seed; or it may be cultivated and manured should it show signs of deterioration. A study of the arrows marked on the plan, which indicate the direction of flow of water, and consequently the contour of the land, will give some idea of the unusual undulations of the surface, and will afford data for criticism.

Surfaces in the Goulburn Valley are, as a rule, more regular, and in the majority of cases, soil preparation (grading, ditching, &c.) will be simple and inexpensive. If, with the expected influx of population from abroad, the extension of the practice of intense culture increases, intelligent direction given in this matter at the start will save much worry



73. PLAN OF SUBDIVISION OF AREA SOWN WITH LUCERNE, WYUNA IRRIGATION FARM.

and loss, and will go far towards popularizing irrigation. The expense is as amply justified as it is absolutely necessary, and it is essential, in order to avoid the grievous mistakes which have been made in applying water to areas utterly unsuitable for irrigation, that these directions be given by practical irrigators, familiar with local and general conditions and with the faculty of imparting their knowledge.

BEES AND THE FERTILIZATION OF FRUIT BLOSSOMS.

F. R. Beuhne, Bee Expert.

To the apiarist who follows bee-keeping as an independent business, the gradual recognition of the bee as an important factor in fruit-growing is very gratifying; because, as fruit-growers become bee-keepers to the extent necessary to success in their occupation, they acquire a knowledge of the habits of the bee which will do much to remove the antagonism between fruit-growers and bee-keepers, which has, from time to time, been noticeable. Without going into the subject of bees and ripe fruit I merely repeat that bees do not injure sound fruit, but will, under stress of a dearth of nectar, collect the juices of fruit damaged by rain, birds, and insects other than bees.

On reading the articles in the January issue of the *Journal* on the "Pollination of Pear Blossoms" and "Sterility in Fruit Trees," and noting the variation in the time of blooming of the different varieties, it occurred to the writer that some further information on the subject of pollination, from the bee-keepers' side, might be useful. Having kept bees as a business for over 20 years and grown fruit in a small way for the same period, my observations lead me to say that the effective fertilization of fruit or any other blossoms, by bees in spring, depends upon the race of bees, the condition of the colonies at the time, and the distance of the hives from the fruit trees.

Races of Bees.

The races of bees introduced to Victoria are four in number, viz., Black, Italian, Cyprian, and Carniolan. The first and last named are black or brown, the other two yellow-banded. All of them were brought to Australia from the northern hemisphere; Black and Carniolan coming from the higher and cooler latitudes, the yellow races from the south of Europe or Africa. As the climate of Australia resembles more that of southern Europe than the northern latitudes of that continent, the yellow-banded races of bees have been found more profitable than the dark races by the honey producers of Victoria.

Briefly, the distinguishing characteristics of the Italian and Cyprian races are greater prolificacy of queens (consequently, a larger worker force) and a longer period of a high rate of reproduction during each season. Italians, when pure, are gentle and easy to handle, while Cyprians much less so, and, under certain conditions—a dearth of nectar or queenlessness—actually vicious. Both these races, however, start breeding rather late in spring but, when once started, rapidly overtake black bees and maintain a higher rate throughout the season.

Black bees are not so quiet as Italian, are less immune from Foul Brood and Bee Moths, and swarm more than the yellow races. They possess, however, two characteristics which are very important to the fruit-grower, namely, they commence brood-rearing earlier in spring than Italians or Cyprians and forage for pollen and nectar on cold, dull and even rainy days, when Italians and, more so still, Cyprians hardly leave the hive.

The failure of fruit blossoms to become pollinated occurs chiefly in early spring and during bad weather. Although, as a honey-producer, I prefer Italians because the colonies are stronger in summer, when the principal honey flows occur, I have no hesitation in saying that, for the fruit-grower, black bees are the best, on account of their earlier breeding and their greater indifference to cold and wet.

The pollen of flowers is used by bees in the preparation of the food of the larvæ, but not required by adult bees during inactivity in winter. It follows, therefore, that the earlier brood-rearing begins in spring the more likely is the fertilization of blossoms to be accomplished by bees in search of pollen. It is fortunate for fruit-growers that black bees and their crosses with Italians, which resemble them in characteristics if not in colour, are more easily procured and better preserve the peculiarities valuable to fruit fertilization early in the season for succeeding generations, than Italians or Cyprians.

CONDITION OF COLONIES IN SPRING.

Much of the value of bees as agents in the fertilization of fruit blossoms in early spring depends upon the condition of the colonies; that is, the number of bees and the amount of honey in each hive. The greater the number of bees and the larger the amount of honey left over from autumn, the earlier will brood-rearing and gathering of pollen commence. Honey is a good non-conductor of heat and therefore greatly protects the bees against the influence of the temperature outside the hive; at the same time, it prevents the loss of animal heat created by the cluster of bees and necessary to the rearing of brood.

A colony of bees, numerically strong and well supplied with combs of sealed honey, will breed earlier and gather more pollen. The bees will also be more effective as fertilizers of blossoms than half-a-dozen weak stocks which are near the verge of starvation. In autumn it is better to have a surplus of honey in a hive than an insufficient supply.

DISTANCE OF HIVES FROM TREES.

The distance to which bees will fly in search of pollen and nectar varies with the season and the weather at time of fruit blossom. On warm sunny days bees will go a mile or more, even in early spring. On cold and cloudy days they do not venture far, and during short snatches of sunshine would probably not visit flowers more than 100 yards distant, if there is no blossom nearer to lead them.

The bee is guided to the blossom by the sense of smell. When the air current is from the hive to the tree the blossom may not be visited, even though comparatively near, unless the weather is favourable enough for the bee to undertake a circular reconnoitring flight during which the scent of blossoms is picked up and followed to its source. Whatever may be the guiding sense in the case of other insects, I am convinced that, with the bee, it is that of smell. I have never succeeded in inducing bees to come near artificial flowers which easily deceived the human eye, but can always rely on them finding a drop of honey placed somewhere out of sight; sometimes it has been necessary to plug up the keyhole of the honey-house.

When bees are kept in or near the orchard the ordinary cleaning flights which bees undertake in spring, whenever atmospheric conditions permit, will bring the blossom within range, but when located half-a-mile away bees cannot be counted on as fertilizers during unfavourable weather. As regards location of the hives, I think that they are best placed in a sheltered position where they are shaded in summer but have the full benefit of the sunshine in winter and spring. This is more easily accomplished by putting them under trees which shed their leaves.

I have not sufficient data on which to base an opinion as to the number of hives required for the fertilization of blossoms on a given acreage. I have always had more bees than are necessary for the number

of fruit trees. One colony of bees should, however, be sufficient for several hundred full-grown fruit trees in blossom at the same time. In any case, the number of hives a fruit-grower can keep is limited by the amount of bee food within range of the bees. The supply must be sufficient to maintain them during the remainder of the season and also provide winter stores.

FRUIT-GROWERS' BEES AND THE BEE DISEASES ACT 1910.

The bees kept by fruit-growers are in many instances in box hives. Where bees are kept only for the benefit of the fruit crop and where the yield of honey is small, owners do not care to incur the expense of modern hives, fittings and appliances.

Under the Bee Diseases Act the keeping of bees in proclaimed areas in other than prescribed hives will be prohibited from 1st January, 1913. A prescribed hive will mean any hive the combs of which are in frames

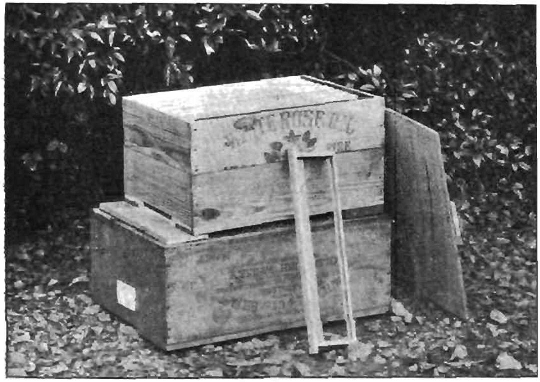
1. SHALLOW TEN-FRAME HIVES AND SECTION SUPER.

easily removable for inspection and having a loose fitting cover. To comply with the Act a frame hive of some kind will therefore have to be adopted by all owners of bees by the end of 1912, as infected areas may be proclaimed by the Governor in Council wherever disease in bees is found to exist. This does not, however, necessitate the purchase of the hives and appliances which the honey producer finds necessary to the successful carrying on of his occupation.

All that is needed is the hive, the frames and, for convenience of handling the bees, a smoker. The wiring of frames, which is necessary when full sheets of comb-foundation are used, can be dispensed with if, in place of the standard Langstroth hive, a shallow frame hive with two sets of shallow frames, instead of one set of full depth, is adopted. Two such hives are shown in the first illustration. Each hive consists of two shallow bodies 17¾ in. long, 14 in. wide, and 4¾ in. deep, inside measurements. The end pieces are rebated ½ in. by ⅝ in. to receive the pro-

jecting ends of the top bars of the frames, ten in number. A narrow strip of comb-foundation, ¾ to 1 in. wide, is fastened to the centre of the underside of the top bar to induce the bees to build the combs straight. When the bees have filled all the frames of both sets with comb and the comb with honey, the outside frames may be removed, the comb cut out, and the frames replaced in the hive. In cutting out the comb at least half-an-inch of it should be left on the top bar and pointed V-shape, when it will act as a starter for the bees to again build the comb in a straight line.

In districts where sufficient eucalypts or other honey plants are left, a section super, as shown on the right in Fig. 1, may be put on instead of cutting the combs out of the frames when the hive is full. The price of a half-storey body is about 1s. 4d., a set of 10 frames, 1s.; floor board, 1s. 2d.; cover, 1s. 3d.; and foundation for two sets of frames, 6d. Thus, the total cost of a hive of two sets of shallow frames is 7s. 7d.



2. SHALLOW TEN-FRAME HIVE MADE OUT OF KEROSENE CASE.

The cost of a hive with one set of full depth frames would be 1s. less, but the shallow frames possess the advantage that honey may be removed without interfering with the brood, which is principally in the lower set of frames, and that wiring of the frames is unnecessary.

If greater cheapness is desired a hive complying with the Act may be made out of a kerosene case, as shown in Fig. 2. It will take the same frames, and the rest for the frames is provided by a strip of wood ⅜ inch thick nailed on the inside of the ends of each half. Even the frames may be home-made out of case wood—top bar, 19 in. long, 1 in. wide, ⅜ in. thick; bottom bar, 17⅝ in. long, 1 in. wide, ⅜ in. thick; side bars, 3¾ in. long x 1⅜ in. wide x ⅜ in. thick; nailed together as shown in Fig. 2. In practice, however, it will be found more satisfactory to buy the frames, even when the hive itself is made at home.

As the articles in the January issue have drawn attention to the value of bees in the orchard, some fruit-growers will probably wish to acquire

bees. It would be as well if they started with a frame hive. Those who already possess bees may conveniently effect the transfer by hiving their swarms in frames instead of empty boxes. Numbers of fruit-growers are well versed in bee-culture, and keep bees in standard frame hives. The latter part of this article is intended for those who, from lack of time or inclination, have so far retained the box hive.

TOBACCO CULTURE.

(*Continued from page* 184.)

T. A. J. Smith, Tobacco Expert.

Curing.

Curing is without doubt the most important matter in connexion with the production of good leaf, and it is here that growers have much to learn with regard to making the best of the leaf grown. The mere drying out of tobacco is not curing. The latter is a much more complex process.

TOBACCO CASK AND TOBACCO HANGING IN SHED.

Tobacco leaf undergoes certain chemical changes during the curing process due to the action of ferments which are contained in the leaf cell, or protoplasm of the leaf cell. If the life of the leaf is killed by being frozen, or scorched by too great heat, a cure of that part of the leaf affected cannot be obtained, neither will the later process of fermentation take place. These ferments are called enzymes, and unless the conditions necessary to enable them to perform their work are present, a perfect cure is not possible. The aroma of tobacco is lost without a proper cure, and the flavour also is left undeveloped to a larger extent.

A too rapid drying destroys the enzyme. Cold and wet also have the same effect. Therefore, it will be observed that the curing process should be gradual, and calculated to encourage the development of this active agent in the cure; temperatures between 50 deg. F. and 150 deg. F. are the most favourable. In some tobaccoes where colour for wrappers, and other qualities besides those of aroma are required, this enzyme is not fostered to so great a degree, but is still necessary for the fermentation process. Yellow leaf is an instance. Plug and cigar tobaccoes are, how-

ever, very dependent on the development of this agent, which will rid these tobaccoes of the strong bitter flavour and bad aroma they would otherwise possess, and improve the colour, texture, and smoking qualities of the leaf.

Different types of tobacco require different treatments, and the same tobaccoes will require a modification of the rules laid down for each type, according to the state of the tobacco when harvested. For instance, tobacco harvested in a wet season will contain more sap than that harvested in a dry, and will take longer to cure. Therefore, the grower must use his own judgment as to the process to be employed in any particular season, and must carefully watch the effect of his treatment on a certain portion of the tobacco undergoing the cure in the shed, and be guided by that. He should remember that too fast curing is much more risky than slow. Fast curing will be liable to fix the green colour in the leaf, and destroy the flavour.

Bright yellow tobaccoes are taken straight from the field to the shed in America, and the plants hung on the sticks at the rate of eight or ten to the stick. These are placed on the tiers 7 or 10 inches apart, and the fires immediately put under.

The following formula laid down by Mr. R. Ragland, of Virginia, U.S.A., is the basis of all subsequent treatments for bright tobaccoes. The heat is supplied by flues or charcoal fires, and is applied as follows:—

1. The yellowing process requires at 90 deg. F. from twenty-four to thirty hours.

2. Fixing the colour, beginning at 100 deg. F. to 120 deg. F., over sixteen to twenty hours.

3. The curing process, 120 deg. F. to 125 deg. F., over forty-eight hours.

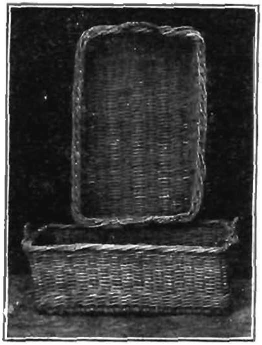
4. Curing the stem, 125 deg. F. to 175 deg. F., over nine or ten hours; increased at the rate of 5 deg. F. per hour.

Between each heating process the tobacco is allowed to cool down, and absorb moisture by opening the shed to the night air. The same treatment has been applied to tobacco in the North-east, excepting that the tobacco was scaffolded for five days, with success. Our tobacco does not appear to yellow in the field, as is the case in parts of America, and this is due probably to the use here of only the richest soils, whereas there only light soils are used for bright types. Should the leaf while curing show moist brown spots close to the mid-rib, indicative of decay, the shed should be well ventilated, or a temperature of 110 deg. F. will stop the progress of the disease. This temperature will have to be raised by the use of fires.

The system in vogue in America for curing heavy dark tobacco, is to scaffold for five or six days; then, as soon as the shed is filled, to put fires under it. The heat should not exceed 90 deg. F. for twelve hours. After that it is taken up to 150 deg. F. by a gradual process. The leaf and half the stem should be cured in three days and nights. Then the tobacco should be allowed to become soft by absorption of moist air, and again dried out by fire. After this the tobacco should never be allowed to get very damp; but should have slow fires put under in wet weather.

In Victoria, the system for curing heavy dark leaf has been very much the same as obtains in Kentucky for chewing tobacco, that is, chiefly air curing. If the weather is very dry, the shed is closed during the day, and opened at night. Small fires are put under in wet weather, and a current

of air caused. A most reprehensible practice amongst local growers is the burning of the stalk while stripping the leaf, which is much damaged in aroma and flavour thereby. Only clean burning woods should be used in open fires for heating the sheds. The pits in which the fires are made should be at least 2 feet deep and 4 feet long, and be covered with sheet iron to prevent danger of fire. Stoves and flues would be a great improvement on the open fire. Many good crops of leaf have been spoilt in the shed through want of fires after the cure has been effected. The tobacco has been allowed to become too damp, and the lower half of the leaf covered with mildew. This deteriorates the quality and spoils the reputation of our leaf; every year large quantities of such tobaccoes are put on the market. Tobacco is a great absorbent, and will become moist, and dry out again with every change in the weather, unless the conditions of the atmosphere are regulated by fires in the shed.



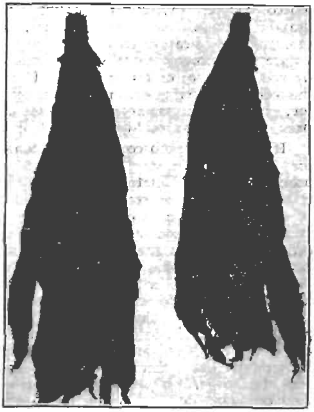
BASKETS FOR CARRYING STRIPPED GREEN LEAF.

A very large proportion, fully 90 per cent., of the heavy dark tobacco crop is cured by open fires. In our climate a gradual process is necessary, owing to the dryness of the atmosphere, and the fires should not be put under too soon, or be too strong in the early stages, or the colour will be green, and the elasticity of the leaf be destroyed. Care should of course be taken against the risk of fire, and the lower tier of tobacco should be well above the ground, say 9 feet to the tier poles. Water should never touch tobacco from the time it is harvested till it is in the manufacturers' hands. Cigar tobacco is cured solely by the regulation of air and moisture, and the shed must be specially constructed for the purpose, so that it can be made very close, or be thoroughly ventilated at will. In some instances stoves with a pipe running up through the roof are used in our moist seasons, with the object of creating a current of air. The lower ventilators are opened at such times, the moist warm air being driven up and out at the top of the shed. Cigar leaf should not be allowed to get very dry, nor very moist, right through the process, which is a slow one, and requires constant observation. The shed should be kept dark after the leaf is cured, as light has a bad effect on the colour. The curing process will take from two to four months.

STRIPPING AND CLASSING.

This work is usually done during wet weather, when out-door work is not practicable. After the tobacco has been thoroughly cured, and the leaf has become pliant enough to be handled without breaking, stripping can be commenced. The stalk is taken in the left hand, and the leaves pulled off with the right, taking hold of the leaf close to the butt. The bottom leaves are of inferior character, and should be classed as thirds, also all leaves that are badly worm-eaten or of bad colour. Generally speaking,

the topmost leaves also are inferior to the middle, and these should be put into the second or third class, together with any damaged or bad leaves off the middle. The best leaves should be classed as firsts, keeping the long leaves all together, and the shorter likewise. The colours should be kept as evenly as possible together. Texture, colour, size, and soundness should all be taken into consideration. As the leaves are classed they should be tied in hands, or bundles, containing about ten or twelve of the same class or grade, the tie consisting of one of the smaller leaves; the butts should be kept even, and the tie wrapped round as close to the end of the butt as can be done safely, extending down to a depth of not more than 2 inches. The loose end is tucked in between the leaves, and the hand re-hung on the sticks and put up on the tier poles again. These hands can be put close together on the stick, about ten or twelve being the usual number.



HANDS OR BUNDLES OF TOBACCO AS CLASSED IN SHED.

The general practice with local growers is to make only two grades or classes, but this is a mistake: three are quite few enough. In America, as many as twelve are made in some tobaccoes. It is true that this is generally done by the dealer; but, as we have no middleman buying and re-assorting tobacco, it is the more necessary for the Victorian grower to give attention to this particular point. Another mistake has been the making of too large a hand, often four times larger than it should be. Very large hands take longer to tie, and cannot be made as neatly as smaller ones. They are more liable to come loose, and when sampled, after pressing, do not show well, owing to the leaf having pressed flat, while the butts look too large in proportion. The buyer immediately concludes that there is too much mid-rib in comparison with the usable portion of the leaf. The tie also has to be made deeper to hold the larger number of leaves, and this makes the leaf look shorter. The better the appearance of the leaf, the more money it will sell for. It is a good habit to bulk down sufficient tobacco on the sticks, if it is thoroughly cured, to provide stripping for several days. Where the grower has had some experience, the whole crop can be put down for this purpose, but should be re-hung as stripped until bulked for the sweat or fermentation process. The assistance of children can be availed of for stripping, as the work is light and pleasant.

Bulking down for the Sweating Process.

After the tobacco has been thoroughly cured, stripped, and classed, and re-hung in the shed, it should be kept in sweet condition until the spring, by the use of fires or ventilation, and the shed kept darkened. A plat-

form should be made about 1 or 2 feet from the ground, on trestles or logs, the floor of the platform being made of boards or hang-sticks; if the latter, clean straw or bags should be placed on top. Bulking down should never be done while the leaf is so dry that it will crumble, neither should it be put down when the tobacco is so full of moisture that it will mould. The right condition is when the mid-rib will crack two-thirds of the way up the leaf, and if the leaves are squeezed together in the hand they will open of their own volition when released. It is never wise to put tobacco down until the first warm weather in spring. Tobacco can be put down in cold weather, with a large amount of moisture content, and will be safe until the warm weather ensues, when it is liable to mould, and will not sweat properly. The proper season is when the tobacco is coming into condition with the first warm moist weather, that is, after the tobacco has been dry, and is becoming sufficiently moist to handle without breaking, and will stand the tests previously described. It will then go through a mild sweat or ferment, and in three to four weeks' time will open up greatly improved in quality and aroma. Much tobacco has been ruined by non-observance of this practice. If the tobacco is bulked down when the moisture is drying out, after a wet spell, the sweat will not be satisfactory, and unless it has experienced some warm weather, will not be safe to pack, as it will go mouldy in the bale or cask.

Having got the tobacco in good condition, and the season being suitable for bulking down, the tobacco should be taken from the tiers and packed upon the platform, keeping all the butts to the outside. It should be kept as straight as possible, and can be piled to a height of 5 feet. It can be piled while still on the stick, or can be taken off and packed by itself. One fairly large bulk is better than two small ones. The best leaf should be put in the centre of the bulk, with the second grade at the bottom, and the third on the top. When finished, the whole pile should be covered with old tarpaulins, hessian, or any old cloths, over top and sides. The bulk should be examined every few days to see if heat generates, and directly the temperature rises above 80 deg. F., the whole should be turned. The insertion of the hand well into the bulk will indicate whether there is a rise in temperature, but a thermometer placed in the centre of the bulk, with a cord attached, will be a more reliable guide. Tobacco, if put down in the right condition, does not always require turning, but will go through a mild sweat; properly speaking, it should never be packed for market until it has gone through a spell of moist warm weather. Three to four weeks is the usual period allowed for the sweat, but if the weather continues cold after bulking it should be left longer; once it has gone through the sweat it can, if required, be left for months in bulk, and will continue to improve. It should, however, be in a dry situation and be kept dark.

When re-bulking, it is necessary to put the tobacco that was outside in the first bulk to the centre in order to get an even fermentation throughout; also, the hands should be shaken out to allow the admission of air to the leaves during the operation. The work should be done quickly, so as to prevent the tobacco cooling too much. It is sometimes necessary to re-bulk twice or three times, but this rarely happens with plug leaf, unless it has been put down with too much moisture in the tobacco or very moist humid weather prevails during the sweating season.

If it is found that the tobacco does not increase in temperature, the placing of weights on the bulk, in the shape of rails or any other convenient material, will bring about the desired degree of heat.

CIGAR LEAF.

The fermentation of cigar leaf is a much more scientific process, and should only be undertaken by an experienced hand. In America, very few growers ferment their own leaf. Dealers, or middle men, and manufacturers who purchase as soon as the curing process in the shed is completed, carry out this portion of the work and re-grade the leaf for market.

During cigar leaf fermentation a great change in the quality of the leaf is effected. Leaf, which for smoking purposes would be unusable before fermentation, will be rid of deleterious matter and become a first rate article. The effect is brought about by the alteration of the starch in the leaf to sugar, which in turn is consumed in the process. The enzyme or ferment then attacks the protein, nicotine, and tannin, and in this way the harsh and bitter taste is got rid of and the aroma also improved. The natural acids in the leaf, viz., citric, malic, and oxalic, also are changed to acetic and butyric acids, and during the fermentation there is a strong aroma of ammonia, owing to the formation of amido compounds.

Thoroughly cured and fermented leaf will lose as much as 15 per cent. of its weight, the loss being due to organic materials which are injurious to smoking qualities. The leaf will be finer in texture and not so gummy, and be greatly improved in the burn or combustion.

To know just how far to go with the different classes of cigar leaf is the great art of the operator, as it is easily possible to overdo fermentation and only experience can teach the exact requirements of the leaf. Thin leaf, without much gum, will not stand high fermentation, while heavier leaf containing much gum must have a thorough ferment or its good qualities will not be brought out.

Cigar leaf is bulked down in much the same way as pipe tobacco, but with more moisture, which can be applied with a spray until the leaf has taken up from 20 per cent. to 25 per cent. of water. This is generally applied as the tobacco is being bulked. A uniform temperature of from 85 deg. to 110 deg. F. should be maintained during the process, the humidity should be kept at about 75 per cent., and ventilation in the room is necessary.

The temperature will rise the second day and will continue at the rate of 10 deg. to 12 deg. each day. The bulk must be carefully watched to see that the temperature does not rise much faster than this; if it does, the bulk must be rebuilt, the hands being well shaken as they are put in. If, however, the rise is normal, the bulk must be turned as directed, when 110 deg. to 114 deg. is reached. This may be necessary three to four times. When it will be found that the leaf ceases to generate heat, the bulk is then opened and allowed to dry slightly until there is no more moisture, than will allow it to be handled for packing without breaking. It sometimes happens that leaf containing much acid will not ferment readily. When this occurs, a spray of ammonia carbonate, 15 per cent. solution, will have the effect of neutralizing the acidity and enabling the ferments to work under better conditions. There are also several formulæ for adding flavour to low grade cigar leaf which are introduced during the fermentation.

It will be seen from the foregoing remarks that cigar leaf fermentation is not possible with the small grower. There is no doubt that some skilled middleman or the manufacturer should undertake this portion of the work. Several of the Melbourne factories are now fermenting

Australian cigar leaf with good results, and have built rooms in which temperatures and humidity can be regulated. Should, however, any growers wish to experiment, it is well to advise them that a temperature of 120 deg. is as high as it is safe to allow tobacco to go, though in rare cases 130 deg. has been used. If this is exceeded the life in the leaf is killed and the enzyme which performs the work desired is destroyed; consequently, the leaf is not changed. It must be borne in mind that the whole process is partly a life and partly a chemical one, so too much care in observing the necessary conditions cannot be taken.

Experiments have been carried out by the Department of Agriculture in inoculation with pure cultures of ferments from Havana grown leaf. Though the tobacco so treated turned out well, further experiments will be necessary before it can be definitely stated that the success was due solely to inoculation.

(To be continued.)

RAIN TREES.

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist of Victoria and Professor of Botany and Plant Physiology in the Melbourne University.

It is a very common superstition that particular trees have a special power of producing, manufacturing or condensing rain, and one of the trees with which this superstition is most closely connected is the so-called "Rain Tree or Guango" of Mexico and Peru (*Albizzia Saman*, F.v.M. (*Pithecolobium Saman*, Benth.). For instance, a correspondent recently forwarded a newspaper cutting on the Rain Tree of Peru, containing the following statements:—

> Plantations of the Rain Tree of Peru, the "tamarcaspi," are claimed to offer great possibilities as irrigation works. The tree grows readily in any soils, reaching a large size, and has a luxuriant foliage, with a remarkable power of collecting and condensing atmospheric moisture. Its capacity, moreover, is increased by the usual heat of a drought. The water falls from the leaves and oozes from the trunk, and forms veritable rivers, which can be led as irrigating canals to any point desired. A single tree is estimated to average nine gallons of rain a day. Making liberal allowance for evaporation and infiltration, a square mile grove of the trees would supply for distribution about 100,000 gallons of water daily.

Needless to say, such statements are quite ridiculous. No trees have the power of condensing or manufacturing rain. The roots of many trees contain stored water. The stems of others, when cut across, may bleed freely and the leaves of grasses and other plants often show, particularly in the early morning, adhering drops of water, which are not dew drops but which are actually exuded by the plant. In all such cases, however, the water in question is absorbed from the soil by the roots of the plant, and if the soil is dry the plant will soon die from lack of water. The "dew drops" on grass leaves are naturally most common when the air is moist, but this is simply because the roots continue to absorb water; but the leaves, being in moist air, lose little or none, and the excess water is exuded from the leaves in liquid form. As soon as the air becomes dry, and the leaves are transpiring actively, the exuded drops of water dry up and disappear. This statement is not to be taken as a denial of the fact that dew may form on leaves if they happen to be in moist air and are colder than the surrounding atmosphere. But such dew rarely forms large

drops, and as a general rule, is deposited more readily upon inanimate objects than upon living plants.

In the case of certain desert plants which become covered with saline incrustations, it has been suggested that these incrustations may aid in drawing moisture from the air, and so providing the plant with water. As a matter of fact, the presence of such incrustations on the leaf would tend rather to draw water out of the leaf than from the air, if they had any appreciable effect at all, and so instead of providing the plant with water, would probably aid in robbing it of what it had.

Trees and plants generally do not directly affect the rainfall of a country to any appreciable extent, although the presence of timber on land has the same effect as an increase in the rainfall, and that in various ways. Firstly, the shelter afforded by belts of timber protects the land between from scorching winds. Secondly, the soil is held up and kept loose and permeable to a greater depth on forest country than on the hard, open, baked soils of plains. Hence, less of the rain runs off, more penetrates and to a greater depth, from which it is steadily drawn by the trees during the dry months. This is a very important factor in keeping the air moist and also in moderating the temperature within a very limited, but still quite appreciable range.

In regard to the so-called "Rain Tree" of Peru, this is highly recommended by Baron von Mueller as a rapidly growing shade tree, particularly for roadsides. He also mentions that the foliage is shut up at night so that rain and dew fall through and thus allow grass to grow beneath. The foliage, however, also closes up more or less in strong sunlight, so that it is difficult to see how the tree can be classed as a good shade tree, and it is in fact largely the absence of complete shade which allows grass to grow beneath it. The statement is also made on the authority of the Consul for France at Laroto, that its foliage possesses the power to an unusual extent to attract and absorb aerial humidity. So far as is known, no tree has any such special power. A dense stretch of tall timber, by compelling rain clouds to pass over at a slightly higher elevation, may aid in squeezing out a little more moisture than if the trees were not there, but this is a purely physical action strictly comparable with the action of a mountain range in causing rain to fall from the clouds as they ascend to pass over it and hence lose heat. The action can never be very pronounced, since the densest belt of timber is not nearly so perfect a barrier as a mass of land of equal height, and an average difference of thirty to a hundred feet or so in elevation is, under ordinary circumstances, only a small factor in influencing rainfall.

This particular tree, under the name of "Rain Tree," has been largely exploited and sold in Australia, under the erroneous supposition that it could be credited with special rain-making properties. As has already been mentioned, it has no special influence upon the rainfall, and its action in ameliorating climatic conditions in bare treeless localities, does not differ from that of any ordinary freely growing tree. So that the use of the term "Rain Tree" for this plant, in the sense mentioned above, is absolutely incorrect. The name probably arises from the fact that, during dark rain-storms, the leaflets fold together in the same way that they do in darkness, so that the tree gives no shelter from the rain, and the use of the name in its later significance is only another instance of how the meanings of names are corrupted or distorted, especially when doing so enables the seed of only a moderately useful tree to be sold at a price and in quantities beyond its real value.

THE WINE INDUSTRY IN SOUTHERN FRANCE.

Department of Hérault.

(*Continued from page 205.*)

F. de Castella, Government Viticulturist.

Methods of Pruning and Training the Vine.

The methods governing the pruning and training of the vine in this, the region of the world's heaviest bearing vineyards, might naturally be expected to constitute a valuable object lesson. A critical examination of them does, in fact, reveal several points of interest. More particularly as regards summer treatment, the views held are most earnestly recommended to the attention of our growers. Strikingly different though they may be, to those frequently expressed in Victoria, they are far more in accordance with the laws of vegetable physiology, and essentially suited to the maintenance of the vine in continued productiveness under warm, dry climatic conditions. Their adoption would lead to the correction of some of the chief mistakes made by our northern viticulturists. Before dealing with these matters, however, something must be said concerning

The Distance Apart at which Vines are Planted.

To a Victorian the vines appear very close. The great majority of the vineyards are laid out "on the square," with the vine at 1 m. 50 x 1 m. 50 (4 ft. 11 in. x 4 ft. 11 in.). A few vineyards, it is true, are planted at 1 m. 75 x 1 m. 75 (5 ft. 9 in. x 5 ft. 9 in.), but the former distance—say, 5 x 5, in round numbers—is the general rule.

A few vineyards are planted in rows *à la provençale* (Provence style) at 2 m. 30 x 1 m. 15 (7 ft. 6½ x 3 ft. 9¼). This is particularly advantageous where horse-drawn spray pumps and sulphuring machines are employed. The absence of gaps between the vines permits the use of a continuous spray without loss of spraying material, which would be inevitable with vines planted on the square, and therefore with a greater interval between them. At one large vineyard I visited, the whole 225 acres could be sprayed in nine days by four spray pumps carried on pack horses—a convenient arrangement, probably very suitable for spraying our potatoes.

Nevertheless, 5 x 5 is the arrangement which has found most favour in the region since time immemorial. It is worthy of note that, owing to the supposed greater vigour of vines grafted on resistant stocks, it was recommended, in the early days of reconstitution, to plant them somewhat wider than the old ungrafted vines. Experience has disproved the utility of such a course, and grafted vines are now planted at the same distance which centuries of experience showed to be most suitable for the region.

This is not the place for lengthy discussion as to the best distance apart. It must be suited to climate, soil and variety, so that no hard-and-fast distance can be laid down to suit all conditions. No doubt, in Hérault, with its heavier rainfall and less active evaporation than are experienced in northern Victoria, the vines can be planted rather closer than with us, yet there is a very wide difference between the 5 x 5 plantation of the Hérault and the 10 ft. x 12 ft. often adopted by our growers.

A plea for very wide planting is often found in the fact that the outer row of a block of vines is nearly always more vigorous than those in its interior. This may be observed, however, even at extreme distances, so

it loses much of its force. In Victoria, the most practical and observant of our growers are coming back from the more extravagant distances they were led to adopt a few years back. In the best of the replanted vineyards at Rutherglen 10 x 6 is usual—a considerable change from the 10 x 10 and 10 x 12 formerly favoured.

That the heaviest bearing vineyards in the world should be planted at 5 x 5 is certainly interesting. As regards quality there can be no possible objection to closer planting, for it is a well known fact that the closer the vines the better is the quality of the wine.

It is highly probable that insufficient preliminary preparation of the soil has, in the past, been responsible for the popularity of very wide planting above referred to. The better the land is worked, the closer together can vines be planted. The roots, being able to extend downwards, do not need to spread laterally to nearly the same extent.

PRUNING.

The Hérault vine varieties (see *Journal*, vol. VIII., p. 471) all belong to the class which carry fruit-bearing eyes at the base of the canes; in other words, they are sorts which are suited by short spur pruning. It is this which, since time immemorial, has been the method universally followed. The number of spurs left to each vine varies considerably, according to the vigour of the variety and the richness of the soil. The vines are formed according to the system known in French as the "*Goblet*," which is too familiar to require detailed description. The vines consist of low stocks, bearing from 6 to 8, and even more arms, which radiate upwards and outwards, each bearing, as a rule, one spur, cut back to two clear eyes and the basal one.

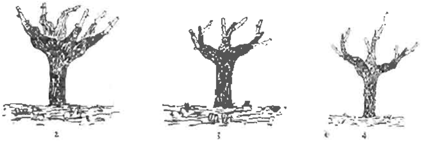
1. "HARE'S EARS" SYSTEM.
Ordinary method, pruned as at A.
"Hare's ears" method, as at B.

The "Hare's ears" system.—This is a modification of the usual "Goblet" method, and is coming into very general use in some parts of Hérault. It is known in French as *oreilles de lièvre* (Hare's ears). The innovation which, by the way, I have not seen described in any work dealing with the pruning of the vine, consists in leaving the spurs in pairs instead of singly, as is usual in "Goblet" pruning. These pairs of spurs are supposed by the vigneron to have some resemblance to the ears of a hare, an animal a good deal scarcer and more esteemed in France than in Australia.

Fig. 1, representing a portion of a short pruned vine, will give an idea of the difference between the old and new methods. According to the former, the pruning would be carried out by means of the cuts marked A. The "Hare's ears" are established by cutting at the points marked B. The same number of spurs can be left to a vine in either case, but, on comparing Figs. 2 and 3, it is evident that the three arms, bearing each a pair of spurs, are less crowded and neater than the six arms with one spur each. The amount of cutting is also reduced. In

Fig. 1 it will be seen that the new method requires three cuts, as against four for the old.

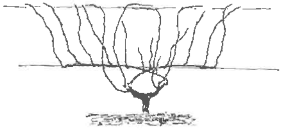
Elongation of the arms is also more thoroughly guarded against, since the lower spur is rigorously limited to two eyes. There is, however, no need to strictly limit the eyes on the second spur, since it will be entirely removed at the next pruning. Two, three or even four eyes may be left, as shown in Fig. 4. A vine pruned in this way possesses considerable elasticity. It is sometimes difficult to gauge the exact number of spurs a given vine is able to properly nourish. By pruning as shown in Fig. 4, even if rather too many buds are left, no harm will be done to the shape of the vine, since the lower buds of the second spur of each pair are those which would remain dormant.



COMPARISON OF DIFFERENT TYPES OF PRUNING.

2 Ordinary short pruned vine with six arms. 3. Vine pruned to three "Hare's ears." 4. "Hare's ears" pruning with second spur of varying length.

The "Hare's ears" style is not only applicable to "Goblet" vines; it also lends itself to cordons (permanent leaders with short spurs situated along them at intervals) trained on wire, so suitable for the Zante currant and several of our good table grapes. In this case, instead of the single spurs usually left, the pruner would provide one-half the number of "Hare's ears." It is scarcely necessary to point out that this method need not be rigorously applied to every arm or portion of a vine; its adoption where the vigour of growth and other conditions warrant it, will, however, no doubt be found useful by practical pruners.



5. "QUARANTE" SYSTEM—VINE BEFORE PRUNING.

"Quarante" style of pruning.—As previously stated, short pruning has always been the recognised system in the region. A departure from this rule was made some years ago by a M. Laforgue in the neighbourhood of the village of Quarante—hence the name of the new method. He trellised and long pruned his vines with atisfactory results. Enormous yields were obtained and some ten years go much prominence was given to the innovation in the viticultural press f southern France. M. Laforgue had several imitators, and at the present time, a good many vineyards are trained on wire and long pruned.

The "Quarante" system of pruning is illustrated in Fig. 5. It is ally a very slight modification of the well known double "Guyot" ystem, so extensively practised in northern Victoria, whenever sorts reuiring long pruning are trained on trellis.

The modification consists in crossing the long rods. This presents everal advantages. The bending of the tissues checks the flow of sap,

with the usual beneficial result in the direction of promoting fruit production. The bases of the rods, which as usual are mostly bare, are the parts which are crossed. This bare portion is covered by the canes from the wood spurs, so that the vine presents a well garnished mass of foliage and the fruit is protected from the hot sun. This crossing of the rods also shortens the length of wire occupied by each vine and enables a greater number of vines to be planted in the row.

Though strongly recommended by its partisans, some of whom have applied it to large vineyards, the considerable increase in yield claimed for it does not appear to have been always obtained. In some cases, though an increase was noted for a year or two it was not maintained and in spite of abundant manuring, smaller yields resulted later.*

The varieties grown in Hérault are eminently suited for the "Goblet" style and, when over 3,000 gallons per acre is frequently yielded by it, the need for improvement does not seem very urgent. Though some varieties will do well with either short or long pruning, others, again, are only suited by the former.† This is probably the explanation of the unsatisfactory nature of several trials. At any rate, the "Quarante" method, in spite of the strong recommendation of its advocates, has only displaced the time-honoured "Goblet" system in a limited number of cases.

Many of the varieties we grow in Victoria are well adapted for long pruning, and for these the crossing of the rods, which is the leading feature of the method, will very probably be found advantageous.

Pruning Tools.—The secateur in general use is the large two-handed one, such as has been adopted in several districts of South Australia but which is scarcely known yet in Victoria. It has no spring, and as it takes both hands to work it, the prunings must be allowed to fall where they are cut. In Hérault, they are afterwards removed by women who make them into faggots which serve for fuel, firewood being scarce and dear. Their value for this purpose is just about equivalent to that of the labour which their collection entails. This specialization is in reality essentially logical. The skilled pruner attends solely to the pruning, leaving the removal of cuttings to unskilled and cheaper labour.

This secateur is made entirely of steel. One of its handles is drawn out to form a small chisel, useful for cutting out suckers, &c. Awkward though this tool appears at first sight, I was assured that a man could prune considerably more vines in a day with less fatigue than if he used the ordinary small secateur. Thorough cultivation, abundant manuring, and a warm summer climate promote very vigorous growth and the canes are so strong as to need a powerful implement.

The Hérault secateur being capable of cutting any portion of the vine one may have to deal with in the ordinary course of events, the saw is scarcely ever required—a distinct gain, and one which is very desirable in our vineyards in which excessive and ill-considered use of the saw is responsible for more damage to the vines than is usually credited.

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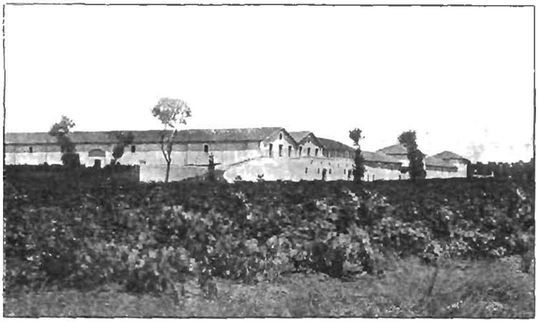
* See M. Jules Leenhardt, *Revue de Viticulture*, Vol. VI., p. 612.

† Coste-Floret, in *Revue de Viticulture*, Vol. VII., page 7[illegible], recalls experiments conducted by Touchy in 1814 when he found Muscats, Aspiran, Terret, Clairette, Pic-Ardant, Aramon, Piquepoul, and Terret-Bourret to do well with long pruning, whilst the following were unsuited for it:—Œillade Noir, Olivette, Alicante (Grenache), Carignane, Spar (Mataro), Mourastel and Cinsaut.

SUMMER PRUNING.

The summer treatment of the vines of Hérault constitutes the strongest possible indictment of summer pruning in warm, sunny climates. A more eloquent condemnation would indeed be hard to find. In this region of heavy yields and intense culture, where no expense is spared which can in any way stimulate production, summer pruning is considered to be not only useless but undesirable. According to the late Professor Foex—

No green pruning operation is habitually practised in Bas Languedoc (the region which includes the Department of Hérault), on account of the danger which is feared of causing a stoppage of vegetation at the moment when the action of drought already tends to slacken its course. *Clairette* alone is sometimes submitted to *pincement* (nipping)* since its exuberant vegetation occasionally leads to *coulure* (faulty setting of the fruit). Disbudding is carried out in some places when the vine is too much crowded with shoots and when, owing to ample moisture conditions, their development is favoured.



6. APPEARANCE OF VINES IN SUMMER AT GUILHERMAIN.

H. Marès, one of the best known writers on viticulture in the "Midi," is even more emphatic. Speaking of disbudding he says—

Disbudding is more widespread than nipping; nevertheless, it does not constitute a general practice admitted everywhere and recognised to be advantageous. . . . . During very hot days when the vines are apt to suffer from sunburn the loss of part of their foliage is prejudicial and increases the damage they are exposed to.

After pointing out that varieties which send out many suckers and water shoots are those on which disbudding should be logically applied, he continues—

Tinto, Espar, Morrastel and Carignane grow from the spur buds and not from the arms of the stock; also, they do not require disbudding.

Concerning nipping, after admitting that it may sometimes be applied to Clairette, he says—

We have several times seen pincement applied to Aramon, Carignane, Grenache. &c., and we must admit that under its influence the yield of the first season was sensibly increased, but it was no longer the same the following years; the vines declined, they were distinctly fatigued, and the yield underwent a considerable diminution. Young vines resisted longer than others, but in the end they undergo the same fate. Also, pincement has not been adopted in the Midi.

* This operation, which might be termed stopping, as opposed to topping, consists in the removal of the terminal bud just before flowering time.

As regards topping (*Rognage*)—

This consists in topping the canes during the currency of summer to favour the development of the berries and to allow more heat and light to penetrate the vines. It is an operation which is diametrically opposed to the conditions under which the vine should find itself in the Midi. Heat and drought demand that the soil should be covered and shaded by the shoots, and that the grapes be protected by foliage capable of preserving them from sunburn. Rognage is not practised, to our knowledge, in the vineyards of the region: in our opinion it would be disastrous.

The above quotations need no comment. They are not merely the advice of scientists, but they are the summing up of the opinions current in the region as the result of centuries of practical experience. The avoidance of summer pruning in Hérault is a lesson our northern growers would do well to take to heart, for considerable injury is in many cases done to our vines by ill-considered topping during the summer. The work is easy and the vineyard is made to look trim and neat, though at the cost of a reduction in subsequent years' yields. It is highly

7. VINES AT AIGUES MORTES BEFORE PRUNING.

probable that the small yields and straggly bunches, borne by Gordo Blanco vines in many irrigated vineyards, are due to no other cause than the excessive summer pruning to which this variety has been subjected during previous seasons.

The trellised Zante currant and sultana do not receive the severe summer treatment meted out to the gooseberry trained Gordo; also, their behaviour as regards continued productiveness is far more satisfactory. Young Gordos usually bear very heavy crops of fine fruit for the first few years; then the bunches become straggly, owing to imperfect setting. To such an extent does this occur that many growers, despairing of obtaining a satisfactory "first crop" from their Gordos, submit them to such a severe early topping as to promote an abundant "second crop" which, curiously enough, often becomes the main crop, with this variety. More logical treatment would secure a satisfactory first crop; the fruit of which is finer and, especially, earlier than the second crop can possibly be.

The evils of summer pruning are insidious and readily escape notice, since it is only on subsequent seasons' crops that they are felt. Indeed, as we have already seen, it usually leads to an *improvement* in yield, the

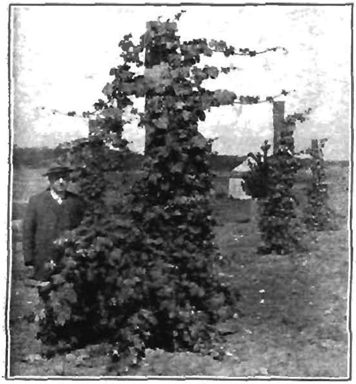
first season it is applied. This digression may be permitted in the hope that it may illustrate one of the lessons we can most usefully learn from southern France.

The summer appearance of Hérault vineyards is not easily forgotten. The abundant foliage completely hides the ground from view. Some idea of the closeness of vegetation will be gained from the photographs reproduced, the first of which shows a small portion of the large vineyard of Guilhermain, during the summer; whilst the second, taken in early winter, just before pruning, shows the amount of growth made by the closely planted (5 x 5) vines at Aigues Mortes.

FIELD-GRAFTING AT THE VITICULTURAL COLLEGE.

G. H. Adcock, F.L.S., Principal.

The accompanying photographs, taken in the Viticultural College vineyard by Mr. Garnet Adcock, show in a striking manner the value of field-grafting—a system which is now rapidly gaining in favour among vignerons, inasmuch as by its adoption considerable time is saved. The rooted resistant stocks, of which large quantities are annually available at nominal rates, are planted out in the vineyard. The following season they may be, and usually are, grafted. The root-system already established enables the scion to develop very rapidly and quickly surpass the bench-graft.



FIELD-GRAFT—5 MONTHS' GROWTH.

The block of land on which the vines illustrated are growing was originally considered so inferior that, when the orchard was planted, it was left severely alone. Not only was it unused but it was quite an eyesore. Under the present management, however, it was thoroughly trenched 2 feet deep. At the same time large quantities of fresh farm-yard manure and vegetable refuse were added. It has been set apart to demonstrate what can be done on small areas with vines trellised overhead, as is adopted somewhat extensively in Spain.

The plot was first planted with rooted grafts imported from France, as it was some newly imported varieties we wished to test. These, unfortunately, arrived in such inferior condition that practically all died. The spaces thus left were planted up as soon as possible with ungrafted, rooted resistant stocks. This was in October, 1909. Rather less than a year later, viz., at the end of last September, these stocks were grafted

by Mr. H. Wilkinson, the College foreman. The strike could not possibly have been better, as every graft was successful. We were not, however, prepared for the phenomenal growth they have made. The posts shown in the photographs stand a clear 9 feet out of the ground. It is proposed to equip them with overhead wires so that there will be no obstacle to cultivation both ways with a team. As will be seen by the illustration, not only has the growth reached the top of these lofty posts, but there is a good deal to spare. In fact, many of the shoots extend over 12 feet. Several vignerons, with considerable experience in grafting in the field, have stated they never saw such extraordinary results.

The vine in the foreground of the first illustration is Ohanez, a table variety of recognised carrying qualities. The resistant stock on which it is worked is Aramon x Rupestris Ganzin No. 1. This, as already indicated, was planted in October, 1909. The grafting was done at the end of the following September. The photograph was taken on the 18th February, so that the growth exhibited has taken place in less than 5 months. Several of these five-month old grafts are actually showing a small crop. Next season they will doubtless produce a fair return.

The second illustration is of another well known table variety, Waltham Cross. It is worked on Rupestris du Lot, and was bench-grafted in the ordinary way during the grafting season 1909. After being callused, it was planted out in the usual manner in the Wahgunyah Nursery where it rooted. The following year (1910), and at about the same time as the field-grafts were put on, this bench-graft was removed and placed in its permanent position as shown in the photograph. It is thoroughly healthy, and has made satisfactory growth for a bench-graft, but cannot compare with the adjoining vines growing under precisely the same conditions, but grafted in the field.

BENCH-GRAFT—18 MONTHS FROM BENCH.

THE MALLEE.

J. M. B. Connor, Agricultural Superintendent.

For some time past I have had opportunities of closely inspecting the different portions of the Mallee—our great wheat province—and have come to the conclusion that it is not only worth saving, as was so repeatedly questioned during the drought-stricken years of 1902-3, when the

farmers were asking the Government to supply seed wheat to carry them on, but that it is one of the richest portions of the State. The general impression existing in the minds of the majority of people living in our large cities is that the Mallee consists of an uninteresting, lifeless belt of flat sandy country, densely covered with scrub and cursed with droughts, sand and flies. Such an erroneous and harmful impression has been the cause, until quite recently, of this splendid country not receiving the attention it deserved from the agriculturist.

Any one visiting the Rainbow country, say, in November, and holding these mistaken ideas, would be agreeably surprised to find large tracts of nicely sheltered, undulating country, waving with tall, luxuriant crops and natural pastures. Having just completed judging the local farm competitions (see January *Journal*), I have had ample facilities of ascertaining what can be realized where improved methods of agriculture are adopted. Rainbow is the terminus of the railway line, due north of Dimboola, and is the centre of an extensive and rich agricultural district.

HARVESTING LE HUGUENOT WHEAT, MR. J. DART'S FARM, RAINBOW.

It derived its name from a peculiar formation of raised land, in the shape of a rainbow, which extends for a considerable distance quite close to the town, and known in the early days as the "rainbow" horse paddock of the Albacutya sheep station. This portion of the run, some fifteen years ago, was regarded as a desert; to-day it is successfully growing wheat, and grazing stud sheep and mares.

The potentialities of this portion of the Mallee are unlimited. The good seasons that have prevailed during the past five years cannot be reasonably expected to continue without a change, but the Mallee generally can now meet a couple of bad seasons with some degree of equanimity. The large yields of wheat produced in the district last season conclusively proved how valuable the Rainbow district is to the State. It had the proud distinction of having delivered to the local railway station the greatest quantity of wheat, a record to be envied. The following figures convey some idea of the rapid progress brought

about by the introduction of better methods of cultivation, the grazing of sheep and breeding of lambs for export.

Bags of Wheat delivered at Rainbow Railway Station.

Year.	Bags.
1905-6	91,000 (4 bushel bags)
1906-7	132,000 (4 bushel bags)
1907-8	84,000 (4 bushel bags)
1908-9	286,000 (standard bags, 200 lbs.)
1909-10	237,000 (standard bags, 200 lbs.)
1910-11	257,000 (standard bags, 200 lbs.)

The district is certainly a land of great promise. Especially will this be so if the farmers generally will plan ahead, always conserve a good supply of fodder during bounteous seasons, and adopt more modern methods of deeper tillage, early fallowing, and rotation of crops. The grazing of sheep must play a very important part in the future prosperity of all wheat-growing centres. They have already practically demons-

HARVESTING LE HUGUENOT WHEAT, MR. J. SANDERS' FARM, RAINBOW.

trated their great benefit from a financial and manurial point of view wherever kept.

During the competition I saw both wheat and oat crops that would more than favourably compare with any crops throughout the State. I also saw a train load of fat lambs, that would grace the best Western District pastures, leave the Rainbow station.

During the past five years the primary industries throughout the Mallee have shown remarkable growth and expansion. The result of the great successes gained by the majority of wheat farmers throughout the Mallee has been to give an impetus to trade, to encourage manufacturing enterprise, and to promote national wealth and prosperity. Last season's record is one that Victoria may be pardonably proud of. The value of our primary products amounted to £27,662,651. In addition, the products of manufacture came to £12,748,654, making a total of £40,411,305. Wheat represented a money value of £5,501,605, while wool totalled £4,044,755. To both of these the Mallee contributed largely. The large tracts of undulating country, now covered

with scrub, and lying idle, only require to be inspected under favourable conditions to be appreciated. Compared with timbered country, the outlay to work the Mallee is comparatively small, and returns are so much sooner obtained.

Selection of Mallee Land.

It is not to be wondered at that there is such a rush of applicants for Mallee blocks, when thrown open for selection, when one takes into consideration the present financial position of some of the pioneers. Numbers started as labourers some ten or fifteen years ago, and are to-day worth many thousands of pounds. Properties valued at from £5,000 to £10,000 are common. One property that came directly under my personal knowledge consists of 1,200 acres. It was purchased nineteen years ago for the sum of £700. For this and an adjoining property of 480 acres, bought ten years ago for £550, no less than £8,400 can be obtained by the owner. There are numerous instances of the land being sold for twice its original price during the past three years.

The remaining available Mallee land to be thrown open will be in areas of from 640 acres to 1,280 acres under a 20 or 40 years' tenure. Any eligible person, eighteen years of age, may take up these Crown lands when thrown open for selection. Applications are dealt with by a local Land Board, and successful applicants may receive a permit to occupy the land immediately after the first rent has been paid. The annual rental charged is according to the valuation of the land, at the rate of 1s. in the £1 for a 20 years' term, or 6d. in the £1 for a 40 years' term, when the freehold is obtained. The freehold is also obtainable at any time after the first six years on payment of the balance of the purchase money. The prices for the different qualities of land are £1 per acre for first class, 15s. per acre for second class, and 10s. per acre for third class. (Where found necessary to clear the roads or make provision for the conservation of water, 2s. 6d. per acre is added.) For the 40 years' term the instalments to be paid by the selector work out, for first-class land, in yearly payments of 6d. per acre; second-class land, 4½d. per acre; and third-class land, 3d. per acre. Further particulars may be obtained on application to the Enquiry Office, Lands Department, Melbourne.

Rolling and Burning Off.

Rolling the Mallee scrub is the first thing to be considered when taking over a block of land. This can be done by contract at from 3s. to 4s. 6d. per acre. In some cases, horses are used, but this is not advisable on account of the continuous risk of injury. Bullocks are more reliable and more satisfactory to do the rolling. The construction and cost of roller and other valuable information regarding the prevailing methods of dealing with the scrub are supplied in the December *Journal*. Experienced settlers recommend rolling during the winter or early spring months, selecting the lightest timbered portion of the block of land on which to commence operations.

When the timber is rolled down during the winter months it is ready for burning off about February, and it is found that, owing to the young shoots having made good headway, a fire at this period acts as a second burn by destroying this new growth and any live stumps. If the work is done by the farmer and hired labour it generally costs 4s. per acre for the first burn; the picking and snagging afterwards, 1s. 6d. to 2s. per acre. February, March and April are the three months of the year set aside for burning-off operations, and it is not legal at any other period

of the year, unless provision is made for a burn during the day-time *when a fire break (not less than 1 chain wide) has been cleared around* the piece of land to be burned off so as to prevent the fire spreading. The usual practice adopted after the first burn is the cutting off of any *projecting stumps that have escaped the fire and that are likely to interfere* with the use of the drill or stump-jump plough.

CULTIVATION METHODS.

After this is satisfactorily performed and sufficient rain has fallen, seed wheat, properly graded and pickled, should be sown broadcast at the rate of 50 lbs. per acre, and manured at the rate of 40 lbs. of superphosphate per acre. On the lighter soil of the Mallee, and where there has been a successful burn on the richer areas, there is no necessity for that quantity of manure to be used. With the ashes and too much manure there is a tendency of unduly forcing the growth in the early stages: the crop becomes too rank and flaggy to allow of good yields of grain. One advantage of sowing heavily the first season is to insure

"BONANZA" OATS, MR. LAVERY'S FARM, WATCHEM.

a good growth of stubble which will assist in the successful burning off of the stumps. The one-way disc cultivator or the skim plough gives better results on the heavier soils than the system adopted of merely discing in the seed. The disc harrow is apt to ridge the ground too much and does not give satisfactory results.

The second year's operations consist of cutting the young growth of suckers; this costs from 3d. to 6d. per acre, according to the amount of new growth. While the crop is growing, further areas may be rolled. About the months of July and August any new shoots showing through the crop should be cut with the two-edged slasher. This can be done by contract at about the same price as the cutting of the new growth after the first crop is taken off. It is advisable, and also profitable, to keep these shoots down by cutting, before harvesting the crop, for the reason that at harvest time the green leaves are often bagged with the wheat when stripped, causing it to heat and often tainting the wheat to

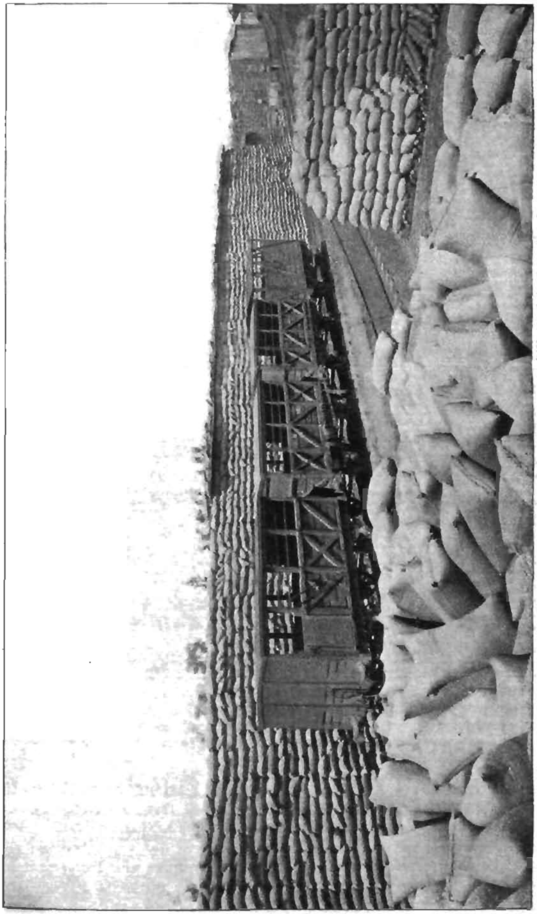
such an extent that its market value is greatly reduced. If the first crop, during the growing period, shows rank growth it will be profitable to feed it off with sheep until well into the spring. By this means the new growth of shoots already referred to can be successfully dealt with.

The third year's operations are similar in character to the first with the exception that it has been found advisable to put in, by drilling, the same quantity of seed per acre, but with about 10 lbs. more superphosphate per acre on the lighter soils and about 10 lbs. less on the heavier soils. If a good burn has taken place the first year there should now be a large number of roots brought to the surface and ready for removal. This can be done at a cost of from 3d. to 6d. per acre. Instead of burning the roots, they should be carted to the homestead and stacked for future requirements. On some of the farms judged there were hundreds of tons of Mallee roots, which will be of great value in a few years' time, for firewood.

After the fourth year's cultivation, on similar lines to the second year's, most of the roots have dried and come to the surface, and can be removed at a nominal cost. By the fourth year the land should be cleared sufficiently to plan ahead, and adopt a reliable system of fallowing and the introduction of a three years' rotation crop system. The great mistake made in most of the fallowing inspected was that it had been ploughed far too late in the season. Fallowing should be completed early in the year so that the ground will be in a condition to absorb the winter rains. Successful farmers recommend deep and early fallowing for several reasons—it increases the water-holding capacity of most soils, admits sunlight and air, extends the root-feeding area, and, by conserving the available moisture, enables crops to successfully withstand long stretches of dry weather. Deep ploughing can only be adopted where there is a good depth of soil and where there is no likelihood of the subsoil being brought to the surface. Subsequent harrowing should be carried out through the fallow season, and more particularly after each rain for the purpose of effecting a shallow earth mulch for the object of conserving the moisture for next year's crop.

During the months of April or May, selected, graded and pickled wheat should be disced or drilled in at the rate of 40 lbs. of seed along with 56 lbs. of superphosphate per acre. If a strong growth of wheat comes away early, eat it off with young stock or sheep, whichever can be most profitably utilized. After stripping or harvesting, the land should be allowed to be in stubble and pasture for the next eighteen months. Provided the season and rainfall are suitable, rape can be sown on the fallow land after the first autumn rains, at the rate of 4 to 6 lbs. of seed per acre. This could be turned to profitable account by grazing sheep, and at the same time help to manure the land and improve its mechanical and physical condition. By utilizing the fallow in this profitable manner, the farmer is increasing the carrying capacity of his farm, and is has been proved by practical results that the heavier the crop of rape, whether it be fed off or ploughed in, the heavier is the succeeding crop of grain. Wherever rape is sown it is always a wise precaution to sow 1 lb. of mustard seed with it to prevent bloating the sheep grazed thereon.

The usual system adopted of working a wheat farm of 640 acres is to divide the area into three divisions, leaving 40 acres for the homestead requirements; 200 acres are put under crop, 200 acres fallowed and 200 acres in grass, so that the cereal crop is always sown on fallow land. Under this system, the Wimmera farmer generally takes two grain crops off the bare fallow land, so that the grazing area for the sheep is increased by their having the 200 acres of stubble to graze on for portion



160,000 BAGS OF WHEAT, RAINBOW RAILWAY STATION, MARCH, 1911.

of the year and thereby increasing the profits. As a profitable rotation, this system can be recommended to the consideration of wheat-growers as a means of helping to keep the land clean of weeds, and maintaining

MALLEE STOCK.

its permanent fertility by always having one-third of the farm under crop, one-third under grass after cropping, and one-third bare fallow, on which rape is grown for spring fattening of early lambs for freezing.

FIELD EXPERIMENTS WITH WHEAT DISEASES, 1910-11.

J. T. Pridham, Field Assistant, Longerenong Agricultural College.

In addition to the improvement of wheat by cross-breeding and selection,* some attention was devoted to the diseases of wheat in so far as they might be observed in the field. From our intercourse with farmers, it is apparent that the heavy toll levied each year by diseases, particularly "Take-all," is not realized.

* Experimental Work at Longerenong Agricultural College, page 151, March, 1911, *Journal.*

Take-all.—This disease is overlooked altogether in a favourable wheat year, though it occurs to some extent every year. Only when the crops are badly attacked, do farmers become alive to the extent of their loss. The reason is partly that the various forms of the disease are not always recognised. In a mild attack, the ears are only slightly discoloured and flat or slab-sided instead of being well filled; such heads contain only thin pinched grain. Then there is the form of the disease where the ears produce no grain and the chaff stands out from the heads which present a bleached appearance known as "Whiteheads." In the worst cases no heads at all are produced and, in all stages, a blackening of the stalk at the foot is characteristic of the disease.

During the second week of December, fifty-one farmers of repute in the Horsham, Pimpinio, Vectis East, Jung, and Murtoa districts were visited with the object of gaining information in regard to the best methods of cultivation. Mr. McAlpine, in his bulletin on Take-all, suggests that preventive measures might be found in a certain method of working the soil. After tabulating the answers to the set of questions propounded to each farmer, we, however, gathered no conclusive evidence that such was the case. Some farmers who cultivated their land thoroughly and others who worked the ground but little had their crops equally badly affected with Take-all. It is generally found that burning off stubble is beneficial, though the evidence did not show any direct preventive effect from the practice. Wheat after oats was rarely found badly affected; it does not pay, however, to fallow for oats—it is more profitable to grow wheat on the fallow land and oats on the stubble.

Crop rotation, as Mr. McAlpine recommends, should be carried out; this again is a matter of £ s. d., though the expansion of the lamb-raising industry may render it practicable. At present, straw crops are almost exclusively grown in the Wimmera as the rainfall suits winter sown cereals.

Table I. shows the prevalence of the disease this season—the paddock was fairly representative of the land under crop in the district. The seed used was plump and graded but not pickled, as it was known to be clean. Sowing was done by hand, single grains being dropped at every six inches in rows one foot apart; it was thus an easy matter to count the plants. There was no Bunt or Ball-smut in the crop.

The Take-all affected plants were found occurring in patches more or less extensive and in all classes of soil. The disease was not confined to badly drained situations, being also found on the high ground. The "partially affected" plants produced some healthy and some diseased ears. It was quite a common thing, when harvesting single selected plants, to find half-a-dozen of the ears pinched and diseased. The "wholly diseased" plants produced no marketable grain. The crossbred seed sown was of the second generation and the most vigorous and healthy class of grain it is possible to obtain; that of the fixed varieties had been selected or pedigreed for two years and was less vigorous, as the table indicates, than the crossbred seed. Ordinary grain, not selected or even graded, would no doubt have shown a still lower percentage of healthy plants. Finding that Federation was the variety most affected with other diseases, the plants which had Loose, Flag and Ball-smut were only counted in the case of that wheat.

Take-all (?) in Oats and Barley.—A disease resembling Take-all was noticed as occurring to a limited extent among the varieties of oats and barley growing on our plots. Specimens were forwarded to Mr. McAlpine, who found a little Rust on the oats and *Helminthosporium* fungus on both

oats and barley, but in our opinion the sickness of the plant was not due to either.

The affected plants were found in patches, in all kinds of soil, in both well drained and low lying patches. The oats were sown rather early (the first week in May), and the barleys quite late—on the 18th July. The seed sown was sound, plump, unpickled grain. All stages of the disease were observed; the worst affected produced no heads, only a few inches of stalk, blackened at the base. All the sick plants were more or less discoloured here and the straw appeared rotten, although the plants were able to produce some heads with sound grain where the attack was mild. The plants were very easily pulled up, the roots breaking off short as if decayed. The soil underneath in such cases contained ample moisture for healthy and full development.

TABLE I.—PREVALENCE OF TAKE-ALL.

Plot.	Variety.	Take-all: No. of Plants affected.		No. Plants Bunt.	No. Plants Loose Smut.	No. Plants Flag Smut.	No. Grains Sown.	No. Plants Grew.	No. Healthy.	Percentage Healthy.	Average per cent. Healthy.
		Partially.	Wholly.								
23–26	Federation	219	40	0	2	6	520	373	106	28·44	
27–30	"	208	47	0	3	7	520	365	100	27·39	
31–34	"	179	38	0	8	11	520	352	116	32·95	27·68
35–37	"	147	38	0	1	9	520	259	64	24·71	
38–40	"	175	31	0	4	7	390	289	72	24·91	
1–2	Yandilla King	97	19	..	..	..	260	175	59	33·71	
3–5	"	135	23	..	..	..	390	220	62	28·18	
6–8	"	153	22	..	..	..	390	240	65	27·08	28.68
9–11	"	182	26	..	..	..	390	275	67	24·36	
12–15	"	247	23	..	..	..	520	369	99	26·82	
16–19	"	206	24	..	..	..	520	338	108	31·95	
41–43	College Purple Straw	167	31	..	..	..	390	247	49	19·83	
44–46	" "	169	32	..	..	..	390	272	71	26·10	
47–48	" "	112	19	..	..	..	260	188	57	30·31	25·01
49–50	" "	110	23	..	..	..	260	184	51	27·71	
51–52	" "	115	21	..	..	..	260	174	38	21·83	
53–54	" "	115	19	..	..	..	260	177	43	24·29	
87	Cedar × Blount's Lambrigg	18	6	..	..	..	130	58	34	58·62	
88–92	" " "	123	52	..	..	..	650	366	191	52·18	
93–96	Cedar × Standard Red	68	21	..	..	..	520	284	195	68·66	
97–98	Cedar × Red King	43	19	..	..	..	260	145	83	57·24	
99–102	Cedar × Genoa	146	42	..	..	..	520	285	97	34·03	
103–106	Cedar × John Brown	132	34	..	..	..	520	285	119	41·75	
107–115	Pigmy × Cedar	275	65	..	..	..	1,170	661	321	48·56	
116–123	Pratt's Comeback × Wallace	331	36	..	..	..	1,040	714	347	48·59	
124–130	Bobs × Wallace	244	54	..	..	..	910	497	199	40·04	Average of all Crossbreds 55·1
131–133	Jonathan × Bobs	118	35	..	..	..	390	234	81	34·61	
134–141	Bunyip × Jonathan	213	48	..	..	..	1,040	605	344	56·85	
142–144	Florence × Firbank	64	11	..	..	..	390	235	160	68·08	
146–150	Federation × Jumbuck	103	23	..	..	..	650	450	324	72·00	
151–158	Federation × John Brown	194	43	..	..	..	1,040	702	465	66·23	
159–166	Federation × College Purple Straw	199	45	..	..	..	1,040	592	348	58·78	
167–179	Federation × Bobs	353	88	..	..	..	1,690	995	554	55·67	
180–185	Federation × Florence	142	49	..	..	..	780	374	183	48·93	
186–193	Federation × Jade	292	77	..	..	..	1,040	732	363	49·59	
194–195	Federation × Yandilla King	58	15	..	..	..	260	207	134	64·73	
196–208	" "	329	74	..	..	..	1,690	1,142	739	84·71	
209–222	Federation × Bunyip	271	85	..	..	..	1,820	1,121	765	68·24	

Pickling Seed with Formalin.—The usual effect of the formalin treatment upon grain seems to be to induce more vigorous germination than where the seed has been sown dry, or without treatment, and much more so than where bluestone is used. This was the case in two out of the three experiments carried out this season. In the first, fifteen small plots were

sown on the 6th May; five with seed pickled with bluestone, 2 per cent. strength, five with formalin ¼ per cent. strength, and five were sown with unpickled seed. The soil was dry at sowing time (the experiment was sown with the object of trying the effect of dry conditions on the germination of formalin-pickled grain) but 28 points of rain fell two days later. In this case the unpickled seed showed a more vigorous crop than that treated with formalin, which was no better than the crop from seed pickled with bluestone.

TABLE II.—PICKLING EXPERIMENT WITH FEDERATION SEED.

Plot.	Treatment.—Pickling was done 7th July, 1910.	Date Sown.	No. of Seeds Sown.	Per cent. Germinated.	Per cent. Bunt.	Per cent. Healthy.	Yield. lbs.	Yield. ozs.
16	Bunt infected and soaked 1 min. in bluestone, 2% ..	7.7.10	100	75	3	96	0	13½
15	Bunt infected and soaked 1 min. in bluestone and salt, 2%	,,	,,	79	0	100	0	11½
14	Bunt infected and soaked 1 min. in bluestone and salt, 1½ %	,,	,,	82	0	100	1	0
13	Bunt infected and soaked 1 min. in bluestone and salt, 1 %	,,	,,	86	0	100	1	2
12	Bunt infected and soaked 5 mins. in formalin, ¼ % ..	,,	,,	85	0	100	1	3½
7	Sown unpickled	,,	,,	95	58	39	0	7½
6	Clean seed, unpickled	,,	,,	81	0	100	1	0

In the second experiment, however (Table II.), the seed was sown in damp soil, in good condition for germination, and the formalin treated seed gave the best results. Where the seed is stated as being Bunt-infected it was well rubbed in crushed bunt or smut balls before sowing. The plots were harvested on 3rd January.

TABLE III.—PICKLING EXPERIMENT—SEED SOWN IN BOXES.

Box.	Cell.	Date Sown.	No. Seeds Sown.	Date Watered.	Per cent. Germinated.
1	A.	17th May	200	17th May	90
1	B.	,, ...	198	,, ...	76
1	C.	,, ...	200	,, ...	94
1	D.	,, ...	200	,, ...	77
2	A.	,, ...	200	17th June	46
2	B.	,, ...	200	,, ...	68
2	C.	,, ...	200	,, ...	91
2	D.	,, ...	200	,, ...	64
3	A.	,, ...	200	16th July	26*
3	B.	,, ...	200	,, ...	45
3	C.	,, ...	200	,, ...	63
3	D.	,, ...	200	,, ...	52
4	A.	,, ...	200	16th August	46
4	B.	,, ...	200	,, ...	34
4	C.	,, ...	200	,, ...	55
4	D.	,, ...	200	,, ...	47
5	A.	,, ...	200	16th September	20
5	B.	,, ...	200	,, ...	29
5	C.	,, ...	200	,, ...	43
5	D.	,, ...	200	,, ...	24

* This cell was attacked by mice.

A third experiment was carried out under cover, in boxes. Federation wheat was used—a graded plump, hand-picked sample. It was sown one inch deep, in shallow boxes, in soil which was quite dry and in good mechanical condition. The boxes were each divided into four cells (A, B, C, and D), and each box watered at the times indicated in Table III. What was most noticeable throughout the experiment was that the soil in cell C appeared to be less hard and compact in every case than the soil in the other cells. Our method of counting the germinated seeds was to pluck the seedlings as soon as they appeared well above the ground. The plants

sprouted more strongly and showed the best growth in the formalin cells. In each box —

cell A was sown with seed unpickled.
,, B ,, ,, pickled with Bluestone 1% soaked 1 min.
,, C ,, ,, ,, Formalin ¼% soaked 5 mins.
,, D ,, ,, ,, Bluestone 2% and salt 2% soaked 5 mins.

Mr. H. L. Bolley,* of the North Dakota Agricultural College, U.S.A., considers that unpickled seed, though free from bunt spores, is not in a sanitary condition for sowing. He says :—

Treat all grain with formalin, for seed from crops affected with patches of diseases (such as Take-all) carry spores of these parasites on the outside of the grain as in the case of Smut, and the formalin pickle easily destroys all such spores. This is why treatment for Smut in this way has always shown an increase of crop, even though the grain so treated is known to be free from smut.

This seems to throw some light on the behaviour of formalin as shown in Tables 2 and 3, though why the same result was not found in the first quoted experiment we are unable to say.

Pickle Employed by Farmers.—In 1909, the New South Wales Wheat Experimentalist found that bluestone apparently killed 30 per cent. of the grain, and in our experiments at this College in the same year we found the damage to be 34 per cent. This season, however, in New South Wales, the percentage apparently killed is only eleven, and in our own plots bluestone was also less destructive this season. It was thought that some farmers were using the bluestone in rather too strong a solution and an experiment was undertaken to test this. The seed used was supplied mostly by farmers in the district and was pickled by them in bulk. The other samples were also pickled in bulk as for field sowings.

The soil chosen was as even in character as possible and at sowing time was in good condition for germination. The grain was graded and all broken seeds removed. Single grains were sown 3 inches apart in drills one foot apart, 100 seeds in each plot. After sowing (31st May and 1st June) at a uniform depth, the drills were filled in and the soil raked level. When the plants appeared above ground the untreated plots were seen to be more vigorous than those sown with pickled seed, and the bluestone and salt plots appreciably less vigorous than the plots from seed pickled with bluestone alone. No smut was found in the plots. The results show that the strength of bluestone pickle in general use by farmers in this district is about correct.

TABLE IV.—FARMERS' PICKLING EXPERIMENT.

Plot.	Name of Farmer.	Treatment.	Variety.	Per cent. Germinated.	Per cent. Killed.	Yield. Per Plot.	Yield. Average.
						lbs. ozs.	lbs. ozs.
42	H. J. Bodey ..	Not pickled ..	Federation	89	11	1 3¼	0 14¼
68	,, ..	,, ..	,, ...	82	18	0 9¼	
41	,, ..	Bluestone ..	,, ...	83	17	1 2½	0 13
67	,, ..	,, ..	,, ...	74	26	0 7½	
40	J. Cunningham ..	,, ..	Dart's Imperial ..	87	13	1 5½	1 0
66	,, ..	,, ..	,, ..	86	14	0 10½	
39	S. Cornell ..	Not pickled ..	Federation	86	14	0 15½	0 14½
65	,, ..	,, ..	,, ...	83	17	0 13½	
38	,, ..	Bluestone ..	,, ...	93	7	1 4½	0 15½
64	,, ..	,, ..	,, ...	90	10	0 10½	

* Bulletin No. 23 (re-issued Feb., 1910), North Dakota Agric. College, U.S.A.

TABLE IV.—FARMERS' PICKLING EXPERIMENT—*continued*.

Plot.	Name of Farmer.	Treatment.	Variety.	Per cent. Germinated.	Per cent. Killed.	Yield. Per Plot. lbs.	Yield. Per Plot. ozs.	Yield. Average. lbs.	Yield. Average. ozs.
37	J. H. Gross ..	Not pickled ..	Federation	90	10	1	4	1	0½
63	,, ..	,, ..	,, ...	84	16	0	13		
36	,, ..	Bluestone ..	,, ...	77	23	0	15	0	12½
62	,, ..	,, ..	,, ...	84	16	0	10		
35	W. Johns ..	,, ..	,, ...	72	28	0	14½	0	15¼
61	,, ..	,, ..	,, ...	78	22	1	0		
34	J. F. Johns ..	Not pickled ..	,, ...	93	7	1	8	1	2½
60	,, ..	,, ..	,, ...	89	11	0	13		
33	,, ..	Bluestone ..	,, ...	92	8	1	2	0	15½
38	,, ..	,, ..	,, ...	86	14	0	13		
32	W. Langley ..	Not pickled ..	Dart's Imperial ..	93	7	1	9¾	1	6½
58	,, ..	,, ..	,, ..	91	9	1	3½		
31	,, ..	Bluestone ..	,, ..	82	18	1	3½	1	2
57	,, ..	,, ..	,, ..	67	33	1	0½		
30	G. Mills ..	,, ..	Federation	88	12	0	15	1	1½
56	,, ..	,, ..	,, ...	86	14	1	4		
29	Molineux Bros. ..	,, ..	,, ...	92	8	1	5½	1	5¼
55	,, ..	,, ..	,, ...	91	9	1	5		
28	J. Morcom ..	Not pickled ..	,, ...	87	13	1	0½	1	2
54	,, ..	,, ..	,, ...	86	14	1	3½		
27	,, ..	Bluestone ..	,, ...	82	18	0	15½	1	0¾
53	,, ..	,, ..	,, ...	78	22	1	2½		
26	,, ..	,, ..	College Purple Straw	81	19	1	2	1	2¾
52	,, ..	,, ..	,, ,, ..	72	28	1	3½		
25	W. Puls ..	Bluestone and salt	Dart's Imperial ..	78	22	0	12½	0	13¼
51	,, ..	,, ,, ..	,, ,, ..	81	19	0	14		
24	T. Shearwood ..	Not pickled ..	Federation	89	11	1	3	1	3¾
50	,, ..	,, ..	,, ...	94	6	1	4½		
23	,, ..	Bluestone ..	,, ...	86	14	1	2½	1	1¾
49	,, ..	,, ..	,, ..	87	13	1	1		
22	J. Stewart ..	Bluestone and salt	,, ...	71	29	0	9	0	9½
48	,, ..	,, ,, ..	,, ..	61	39	0	10		
21	Longerenong Agricultural College	Bluestone ..	Yandilla King ..	70	30	0	11½	0	13¼
47	,, ,,	,, ..	,, ..	70	30	0	15		
20	Dept. Agric. ..	Not pickled ..	Purple Straw ..	78	22	1	0	1	1
46	,, ..	,, ..	,, ..	79	21	1	2		
19	,, ..	Bluestone and salt	,, ..	71	29	0	15½	0	14¼
45	,, ..	,, ,, ..	,, ..	73	27	0	13		
18	,, ..	Not pickled ..	Yandilla King ..	80	20	1	4	1	3¾
44	,, ..	,, ..	,, ..	84	16	1	3½		
17	,, ..	Bluestone and salt	,, ..	69	31	1	0½	0	15
43	,, ..	,, ,,	,, ..	61	39	0	13½		

SUPPLEMENTARY EXPERIMENT SOWN 19TH JULY.

Plot.	Name of Farmer.	Treatment.	Variety.	Per cent. Germinated.	Per cent. Killed.	Per Plot. lbs.	Per Plot. ozs.	Average. lbs.	Average. ozs.
89	R. Humphreys ..	Bluestone and salt	Dart's Imperial ..	44	56	0	5½	0	6
90	,, ..	,, ,, ..	,, ..	56	44	0	6½		
91	,, ..	Not pickled ..	,, ..	86	14	0	12	0	11¼
92	,, ..	,, ..	,, ..	82	18	0	10½		
93	,, ..	Bluestone and salt	Federation	76	24	0	10	0	10
94	,, ..	,, ,, ..	,, ...	77	23	0	10		
95	,, ..	Not pickled ..	,, ...	75	25	0	9½	0	12½
96	,, ..	,, ..	,, ...	92	8	0	15½		

Average per cent. killed with bluestone pickle .. .. 17·9 per cent.
,, ,, ,, ,, and salt .. .. 31·8 ,,

Other Diseases.—Loose Smut was fairly abundant this season and Flag Smut was plentiful. Federation suffered most, but, as Table I. sbows, the percentage of plants effected with Flag Smut is small compared with the loss due to Take-all.

Rust was also present on Federation and the Purple Straw varieties especially. Adopting a scale of numbers 0-10, and reckoning 0 as "rust-free" and 10 as "badly rusted on the bare stalk," the degree of rust on the above wheats would be 2.

Conclusion.—There appears to be an urgent need for more extended investigation into the diseases of wheat, especially Take-all. This line of work is of more economic importance even than the manuring of the crop and the improvement of varieties by cross-breeding and selection.

THE IMPROVEMENT OF CEREALS.

SOME SUGGESTIONS FOR FARMERS.

H. Pye, Principal, Dookie Agricultural College.

During the last decade or so, scientific plant breeding has begun to be appreciated by the ordinary farmer as something not to be ignored. This appreciation is due to a recognition of the fact that the results of the work of plant breeding have a not inconsiderable effect on the financial aspect of the farmer's business. Science has produced, and is producing, plants suitable for each of the many classes of soils and for the ever-varying climates of the habitable regions of the world.

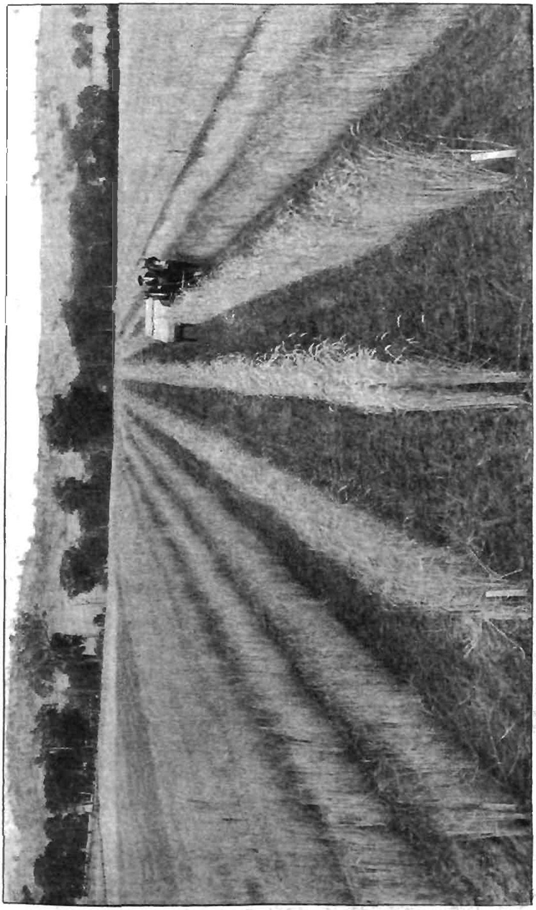
The specialist works under limitations and recognises the fact. The mere fact that his work is usually confined to a circumscribed area confirms him in the opinion that he needs the assistance of the thoughtful and observant agriculturist.

A variety that succeeds in one soil may fail in another, even where climatic influences are similar. Although the work of the specialist may occupy too much of the farmer's time if he were to take it up to any extent, still it is the duty of the latter to develop the yielding and other economic factors of a variety that suits his conditions. He can do this by close attention to selection, grading, and thorough tillage. To a limited extent he may even venture on the work of cross-fertilizing plants, and there is not the least doubt that in the future he will; for the very simplicity of the work, in many instances, will induce the educated, far-seeing farmer to take up the work as a profitable and interesting hobby.

HOW THE FARMER MAY IMPROVE HIS SEED WHEAT.

It is noticeable that in every crop of wheat there are slight individual differences among the plants. The variation may be in the quality of the straw, in the tillering proclivities, in the length of the ripening period, or in the development of the ear and flag respectively. These variations are apparent in every crop, even (though to a more limited extent) in crops produced from pedigreed seed in the production of which every care has been taken. This is also apparent in plants derived from a single mother plant and grown in rows, where the seed is sown several inches apart in order to enable the experimenter to study the individual qualities of each plant.

As a rule, the farmer considers prolificacy to be the quality of the greatest importance, and the ear, provided the other economic qualities are present, is his main consideration. He selects from a tried variety those ears in which the number of fertile florets is greatest, and sows the seed from each plant in separate rows, the seed being from four to six inches apart in the row, and the rows one to two feet apart. In order to accumulate the seed, the rows giving the best yields may be drilled in, but before harvesting he should select several special plants and grow the seed from each in the following season's stud plots.



HARVESTING EXPERIMENTAL WHEAT PLOTS, DOOKIE AGRICULTURAL COLLEGE.

CROSSBRED WHEATS, DERIVED FROM THE SAME PLANT, SHOWING THE VARIATIONS IN TYPE.

At the Dookie Agricultural College the best plant of the stud plot of a commonly grown variety is tested in the single-seed plots every season. Any plants not well developed are thrown out, and the seed from the remaining plants, except the one for next season's seed in the single-seed

PROLIFIC CROSSBRED WHEAT EARS.

plots, is drilled in on a well prepared piece of land. This plot is culled over as much as possible and then harvested. This forms the seed for the third year's plot, after which the seed passes out of the experimental areas on to the farm. Thus there is always an area of highly improved seed

coming on for each season's cropping on the farm. With the one or two varieties the farmer grows it is a simple matter for him to improve the yielding qualities of his crops if he once sees the benefit of it. No doubt the training given at the Agricultural Colleges, Agricultural High Schools and Farmers' Classes will do much towards the coming generation of farmers considering this interesting and profitable work worth while doing. The work should be continuous, as these individual variations are inherent in the varieties, and neglect to continue their selection for several seasons would result in a marked deterioration.

By selecting a number of the best ears from a crop and sowing the seed in a separate plot, it is possible to make an improvement in the yields; but this is not as satisfactory a method as the first.

It may happen the farmer sometimes finds a natural sport derived from a self-fertilized plant. In such an instance it may be worth his while developing the new type, which may possibly throw true; but as a rule any sports found (these are somewhat rare in wheat) are due to accidental cross-fertilization.

PROLIFIC BALD BRANCHING TYPES OF WHEAT EARS.

THE SIZE OF THE PLOTS.

The size of the plots would depend on the time at the disposal of the farmer. I might state that the closer the seed is sown in the rows and the nearer the rows to each other the more even and quicker is the ripening of the grain. The outside rows, naturally, unless followed by other plots, would have more space for root spread, especially if the rows are close together, hence check rows are needed if comparing results of the first and last rows with the others.

If the climatic and other conditions were similar each season, the comparative yields of the plots of the different seasons' growth would suffice in order to test the importance of selection, grading, and thorough cultivation. As the seasons vary it is a good plan to sow a few check rows of the bulk sample of seed, when it will be found that the selected seed in the course of years gives a much better average yield over that of the unselected, besides which there is a better check kept on diseases attacking the crop.

When dealing with selections of the same variety and there is not sufficient time for planting out in the stud plot system, equal weights of selected grain may be planted in drills of equal length and the returns at harvest compared. By this method the noting of the individual qualities of the different plants cannot be ascertained to advantage, yet it is better to do this than to make no effort to improve the yield of grain.

The farmer may go further than simply improving the yield of a variety, he may by selection improve those practical qualities as regards

harvesting that a variety may lack; but it is somewhat more tedious and difficult, and here it is that the advantages of cross-breeding become obvious. Cross-breeding is most important, too, in the production of new varieties possessed of good milling and baking qualities, as by its means great variability is obtained.

The farmer should take a few accurate notes of his observations, and keep records of the soil conditions, rainfall, and such other information that may be useful to him in the future.

GOVERNMENT CERTIFICATION OF STALLIONS.

FOURTH ANNUAL REPORT (SEASON 1910-11)

On the Veterinary Examination of Stallions for the Government Certificate of Soundness and Approval.

W. A. N. Robertson, B.V.Sc., Acting Chief Veterinary Officer.

The system of examination of stud horses for the Government Certificate of soundness and approval, having been in active operation for a term of four years, has now become so familiar to all interested in horse-breeding, that it is unnecessary at this period to refer to the inaugrration of the scheme, or to the early stages of the examination as carried out by the veterinary staff of this Department. These matters were fully dealt with in the triennial report issued last year, copies of which may be obtained on application by those to whom the details are not familiar. This report, therefore, refers mainly to the work of the past season.

I.—Analysis of Defects of Stallions Refused Certificates, 1909-10.

Defects.	Draughts.		Lights.		Ponies.		Totals.	
	No. Examined.	No. Certificated.	No. Examined.	No. Certificated.	No. Examined.	No. Certificated.	No. Examined.	No. Certificated.
	408	273	191	147	152	108	751	528
	No. Rejected.	Per cent. Rejected.	No. Rejected.	Per cent. Rejected.	No. Rejected.	Per cent. Rejected.	No. Rejected.	Per cent. Rejected.
	135	33·08	44	23·04	44	28·94	223	29·69
Unsoundness.								
Sidebone ...	84	20·59	...	...	...	...	84	11·18
Ringbone ...	11	2·69	3	1·57	1	·66	15	1·99
Spavin (Bone)	1	·24	2	1·04	1	·66	4	·54
Bog Spavin & Thoroughpin	...	...	1	·52	...	...	1	·13
Curb ...	...		6	3·14	3	1·97	9	1·20
Totals Unsoundness	96	23·52	12	6·27	5	3·29	113	15·04
Below standard for approval ...	39	9·56	32	16·77	39	25·65	110	14·65
Grand totals	135	33·08	44	23·04	44	28·94	223	29·69

It is still early for any distinct improvement to be shown in the soundness of the rising generation of stallions as a result of the examinations, especially so seeing that there has been no legislative enactment to prohibit the public use of rejected sires; but a noticeable feature on an examination of the past season's work, as well as a search of the entries in one and two year old sections at most of the leading shows, has been the dearth of young stallions got by sires rejected during the early years. Whether any claim can be justified that this is a direct result of the examination, time alone will show, but the cordial support given by the bulk of breeders to the certified as against uncertified horses, which has been referred to in previous reports, is possibly bearing fruit and indicates that at least the best mares have not been put to rejected animals.

During the past season 137 parades were arranged for and held throughout the country, and 100 of these were carried out within the limited period of seven weeks. This, when the distance that had to be travelled is taken into account, is an indication of the amount of work performed by the three members of the veterinary staff responsible for the major portion of the examinations, in the effort made to complete them before the show season came on.

II.—ANALYSIS OF DEFECTS OF STALLIONS REFUSED CERTIFICATES, SEASON 1910-11.

Defects.	Draughts.		Lights.		Ponies.		Totals.	
	No. Examined. 542	No. Certificated. 387	No. Examined. 143	No. Certificated. 108	No Examined. 128	No. Certificated. 101	No. Examined. 813	No. Certificated. 596
	No. Rejected. 155	Per cent. Rejected. 28·58	No Rejected. 35	Per cent Rejected. 24·61	No. Rejected. 2	Per cent. Rejected. 21·09	No. Rejected. 217	Per cent. Rejected. 26·69
Unsoundness.								
Sidebone ...	103	19·00	...	...	...	...	103	12·66
Ringbone ...	3	·55	3	2·10	1	·79	7	·86
Spavin (Bone)	...	...	3	2·10	3	2·34	6	·73
Bog Spaviu & Thoroughpin & Bursal Enlargements	4	·74	1	·70	...	...	5	·62
Curb ...	1	·18	7	4·93	3	2·34	11	1·35
Roaring ...	5	·92	...	...	...	...	5	·63
Shivering ...	1	·18	...	...	...	...	1	·12
Nasal Disease	...	...	1	·70	...	...	1	·12
Totals Unsoundness	117	21·57	15	10·53	7	5·47	139	17·09
Below standard for approval ...	38	7·01	20	14·08	20	15·62	78	9·60
Grand totals	155	28·58	35	24·61	27	21·09	217	26·69

Examinations and Rejections.

During the season a total of 813 horses were examined, a slight increase in the number that were submitted during 1909. Of these 596 received certificates, while 217 or 26.69 per cent. were rejected. This is a decrease of 3 per cent., compared with the rejections during the previous season, but the fact that not so many "scrubbers" were submitted for examination is largely responsible for the falling off. This was particularly the case in the pony class, which shows a fall from 25.65 per cent. refused in 1909, to 15.62 per cent. in 1910, for being below a reasonable standard for approval as regards breed, type and conformation. In other classes, there is also a slight decrease in the percentage rejected under this head as against that of the previous season; but in comparison with the number rejected for the three previous years the percentage is slightly above the average.

III.—Analysis of Defects of Stallions Refused Certificates for Seasons, 1907, 1908, 1909 (to 31/12/09).

Defects.	Draughts.		Lights.		Ponies.		Totals.	
	No. Examined.	No. Certificated.	No. Examined.	No. Certificated.	No. Examined.	No. Certificated.	No. Examined.	No. Certificated.
	1,312	885	787	635	565	453	2,664	1,973
	No. Rejected.	Per cent. Rejected.	No. Rejected.	Per cent. Rejected.	No. Rejected.	Per cent. Rejected.	No. Rejected.	Per cent. Rejected.
	427	32·54	152	19·31	112	19·82	691	25·93
Unsoundness.								
Sidebone ..	265	20·20	4	·51	...	...	269	10·10
Ringbone ...	40	3·05	14	1·77	6	1·06	60	2·24
Spavin (Bone)	7	·53	25	3·18	2	·36	34	1·27
Bog Spavin & Thoroughpin	17	1·29	8	1·02	...	...	25	·94
Curb ...	...	...	20	2·54	11	1·94	31	1·16
Cataract (eye)	...	...	...	...	1	·18	1	·04
Roaring ...	...	...	2	·25	...	...	2	·08
Totals Unsoundness	329	25·07	73	9·27	20	3·54	422	15·83
Below standard for approval ...	98	7·47	79	10·04	92	16·28	269	10·10
Grand totals	427	32·54	152	19·31	112	19·82	691	25·93

Rejections as Regards Soundness.

Under this heading a comparative study of the tables for 1909 and 1910 will show that of the 813 horses examined in 1910, 139 or 17.09 per cent. were rejected for hereditary unsoundness, in one or other of its forms, and as was seen in previous years the draught horse is the breed in which unsoundness most largely exists, the percentage affected in the class being 21.57 per cent. as against 23.52 per cent. in 1909. On analyzing the unsoundnesses upon which rejections were made, ringbone shows the greatest

reduction, being 2.14 per cent. lower than in the previous season, whilst the rejections for that bane of the draught horse, "sidebone," is only slightly lower, 19.19 per cent., as against 20.59 per cent.

Light horses show an all round increase in the percentage of unsoundness, 10.53 per cent., as against 6.27 per cent. last year. This is due to an increase in the number found affected with ringbone, spavin, and curb, while ponies also show an increase amounting to 2.18 per cent., bone spavin being mainly responsible. The table for 1909 is given above for purpose of comparison with that of last season (1910). For the four seasons up to the 1st March last 3,483 stallions have been examined, of which number 2,575 were certificated and 908 or 26.06 per cent. rejected.

IV.—Analysis of Defects of Stallions Refused Certificates for Seasons 1907, 1908, 1909, 1910.

Defects.	Draughts.		Lights.		Ponies.		Totals.	
	No. Examined.	No. Certificated.	No. Examined.	No. Certificated.	No. Examined.	No. Certificated.	No. Examined.	No. Certificated.
	1,856	1,274	930	743	697	558	3,483	2,576
	No. *Rejected.*	Per cent. *Rejected.*	No. *Rejected.*	Per cent. *Rejected.*	No. *Rejected.*	Per cent. *Rejected.*	No. *Rejected.*	Per cent. *Rejected.*
	582	31·35	187	20.12	139	19·94	908	26·06
Unsoundness.								
Sidebone ...	368	19 82	4	·43	...	...	372	10·68
Ringbone ...	43	2·31	17	1·83	7	1·01	67	1·93
Spavin (Bone)	7	·37	28	3·01	5	·72	40	1 14
Bog Spavin & Thoroughpin & Bursal Enlargements	21	1·13	9	·97	...	...	30	·86
Curb ...	1	·05	27	2·90	14	2·00	42	1·20
Cataract (eye)	...	...	...	...	1	·14	1	·03
Roaring ...	5	·27	2	·22	..	..	7	·21
Shivering ...	1	·05	...	...	.	...	1	·03
Nasal Disease	...	...	1	·11	..	...	1	·03
Totals Unsoundness	446	24·00	88	9·47	27	3·87	561	16·11
Below standard for approval ...	136	7·35	99	10·65	112	16·07	347	9·95
Grand totals	582	31·35	187	20·12	139	19·94	908	26·06

A careful study of the accompanying tables reveals very little difference between the average for last year and the average for the triennial period ending in June, 1909. The total given here cannot be taken in any way as indicative of the number of stallions standing in this State, for many have gone to other parts of the Commonwealth, it being known that twenty-eight have exchanged the Victorian Government Certificate for that of South Australia, and no doubt many have died. In this respect owners would lend valuable assistance by reporting deaths of stallions, and the published list could then be regarded as a fairly accurate one of horses standing in Victoria.

New Zealand Examinations.

The arrangement entered into with the New Zealand Department of Agriculture, to issue certificates of soundness for which the Victorian certificate would be substituted without further examination, was continued during the last season and, as will be seen from the table below, 75 horses were examined, of which 12 or 16 per cent. were rejected for unsoundness. Of this number, 46 certificates have been presented for transfer to those of this State, leaving a balance of 29 stallions in which cases the certificates have not been so presented. The following table sets out detailed particulars:—

V.—Analysis of Horses Refused Certificates in New Zealand, Season 1910-11.

Defects.	Draughts.		Lights.		Totals.	
	No. Examined.	No. Certificated.	No. Examined.	No. Certificated.	No. Examined.	No. Certificated.
	71	59	4	4	75	63
	No. Rejected.	Per cent. Rejected.	No. Rejected.	Per cent. Rejected.	No. Rejected.	Per cent. Rejected.
	12	16·90	..	..	12	16·00
Sidebone	4	5·63	...	...	4	5·34
Ringbone	2	2·82	...	...	2	2·67
Curb	5	7·04	...	...	5	6·66
Bog Spavin ...	1	1·41	...	...	1	1·33
Totals Unsoundness ...	12	16·90	...	...	12	16·00

Other States.

Figures are not available from all the States to show a comparative statement, only those of South Australia being to hand. The following table shows the number examined and rejected in that State:—

Examinations and Rejections in South Australia to 31st August, 1910.

	Draughts.	Light.	Total.
Number Examined	233	237	470
Number Rejected	98	38	136
Percentage Rejected	42·06	16·03	28.75

English Examinations.

Although a decision to accept certificates from certain societies in England, Scotland and Ireland, and exchange them for Victorian Government certificates without further examination in respect of horses examined by their veterinary inspectors has been in force for two seasons, importers have not availed themselves of the privilege, contenting themselves with certificates from private veterinary surgeons. Whilst this procedure is of considerable value to them as a means of protection against the purchase of unsound sires, Victorian Government certificates cannot be issued in respect thereof until passed after examination by a veterinary officer of this Government. It is apparently not fully realized by importers that the only

certificate that can be recognised by this Government, and for which a Victorian certificate can be substituted, is one issued officially upon behalf of the societies named in the regulations, not one given by any practising veterinary surgeon.

SPECIAL EXAMINATIONS.

In order to meet the convenience of stallion owners, who through accidental circumstances have failed to submit their horses for examination at one of the advertised parades, a regulation was made during the past season providing for a special examination. The conditions under which this special examination can be availed of are shown in the regulations attached. During the season this convenience was taken advantage of by five horse owners who had been unable to attend at the nearest parade arranged for.

APPEALS.

The appeal provision under clause 5 of the regulations was taken advantage of in three cases during the past season. The first case was in respect of a stallion refused a certificate on account of unsoundness. In this case, the Appeal Board appointed by the Minister was unanimous in dismissing the appeal. In the second case, the certificate had been refused by the examining officer on account of being considered below standard of approval. In this case the appeal was upheld and certificate issued. In the third case, while the rejection was for the same reason, the Board upheld the action of the veterinary officer, and dismissed the appeal. Such a result cannot be other than gratifying, both to the staff and to the stallion owners. That, out of the 217 cases in which certificates were refused, only three owners should avail themselves of the right of appeal, may be taken as an indication of the confidence they repose in the veterinary staff in the performance of their duties; whilst the fact that the only successful appeal was on the question of approval as regards breed, type and conformation, an aspect of the examination which the veterinary officers have had no desire to undertake, but still in respect of which they have exercised their power in 78 cases during the past season, is an indication that even under such circumstances the great majority of owners have been satisfied with their judgment. Even so, the necessity which has been previously pointed out for a staff of competent judges to strengthen this side of the work, is evident.

EXAMINING OFFICERS.

As in previous years the desire to make the examinations as uniform as possible was ever present, and to this end four officers only were engaged in carrying on the work. The results of their individual examinations are shown in the subjoined table.

VI.—OFFICERS' EXAMINATIONS OF STALLIONS, SEASON 1910-11.

Officers.	No. Examined.	No. Certificated.	No. Rejected.	Percentage Rejected.
W. A. N. Robertson, B.V.Sc. ...	256	200	56	21·87
R. Griffin, M.R.C.V.S. .. .	235	161	74	31·62
W. J. Cother, G.M.V.C.	57	43	14	24·56
G. S. Bruce, F.R.C.V.S.	264	191	73	27·65
Appeal Board	1	1	...	...
Totals	813	596	217	26·69

REGULATIONS

GOVERNING THE EXAMINATION OF STALLIONS FOR THE GOVERNMENT CERTIFICATE OF SOUNDNESS AND APPROVAL.

I.—EXAMINATION PARADES.

(1) Societies within whose district an Inspection Parade is appointed are required to provide a suitable place for the examinations to be conducted, and to suitably and reasonably advertise the holding of the parade on receipt of notice from the Department of the fixture. The secretary or some member of the committee of the society is required to be in attendance at the appointed time to assist the examining officer in the arrangements for the inspection.

(2) The Parades will be conducted and the Veterinary Officer will attend without expense to Societies other than that involved in advertising and making known the occasion to the public and the Stallion owners in the district, and providing the examination ground.

(3) The Examining Officer will attend Inspection Parades held at times and places set out in the official Time Table for the year, and all examinations of Stallions for the Government Certificate will be made at such Parades or at Agricultural Shows or on some such publicly advertised occasion, *unless* under special circumstances as provided for in clause 5.

(4) In the event of it being found impossible for local reasons to hold the Parade in any district at the time and date set out in the Time Table, *notice to that effect—together with suggestions for alternative date and time compatible with the rest of the Time Table—should be given* ***not later than 1st June***, after which no alteration in the Time Table can be made.

(5) The special examination of stallions for the Government Certificate of Soundness at other than the advertised district stallion parades may be arranged for in cases where, through accidental circumstances, the owner has failed to submit the horse at such parade.

Such examinations will only be arranged when the attendance of the Examining Officer will not interfere with the requirements of the Department for his services in other directions.

An owner requesting such special examinations will be required to prepay a fee of £1 1s. for each horse examined; also the railway fare (first class return), and travelling expenses at the rate of 14s. per day, of the visiting officer.

II.—GROUNDS FOR REJECTION.

(1) Refusal of Certificate on the ground of unsoundness will be made only when in the opinion of the Examining Officer the horse is affected at the time of examination with one or more of the following hereditary unsoundnesses in any degree, viz.:—

Roaring	Curb	Thoroughpin and Bursal Enlargements
Ringbone	Bog Spavin	Nasal disease (Osteo-porosis)
Sidebone	Bone Spavin	Chorea ("Shivering" or "Nervy")

or such other hereditary unsoundness as the Minister may at any time declare. (Blemishes or unsoundness, the result—in the opinion of the Examining Officer on appearances then presented—of accident, injury, and over-strain or over-work, will not disqualify.)

(2) The Certificate will also be refused in the case of animals considered by the Examining Officer to be below a reasonable standard for Government approval, as regards type, conformation and breeding.

III.—CERTIFICATES.

(1) Particulars concerning the identity of the horse—name, breeder, pedigree, age, prior ownership, &c.—must be furnished to the Examining Officer at the time of examination. If deemed necessary in any case the owner may be called upon to furnish a statutory declaration as to the correctness of such particulars.

(2) Certificates will be issued within seven days of the holding of the Parades, and will be forwarded to the Secretaries of the Societies under whose auspices the Parades are held, and who will either forward them to the owner direct, or deliver them to him on application.

(3) Until the issue of a certificate, or until the publication of the official list of certificated stallions, the result of the Veterinary examination will not be communicated to any person except under circumstances as follow:—The Examining Officer may, on request on proper occasion, communicate to the owner or his agent—duly authorized in writing to inquire—the result of the examination. In case of refusal of the certificate the reasons for refusal will not under any circumstances, save in legal proceedings under the direction of the Court, be communicated to any person except the owner or his agent duly authorized in writing, and to these only on request in writing. Secretaries of Societies, persons in charge of the horse, grooms or relatives of the owner will not be considered authorized agents for that purpose unless they deliver to the officer the owner's signed authority to receive the information.

(4) The Victorian Government Certificate of Soundness can only be issued in respect of horses three years old and over, that have been examined by a Victorian Government Veterinary Officer, or horses in respect of which any of the following certificates are produced:—

The Government Certificate of Soundness of New South Wales, Queensland, South Australia or New Zealand.

The Veterinary Certificate of the Royal Shire Horse Society (England),

The Veterinary Certificate of Royal Agricultural Society (England),

The Veterinary Certificate of Royal Dublin Society (Ireland).

The Veterinary Certificate of Highland and Agricultural Society (Scotland),

The Veterinary Certificate of Glasgow and West of Scotland Agricultural Society.

Any horse which has been rejected by the Veterinary Examiners for any of the above certificates will not be eligible for examination for the Victorian Government Certificate of Soundness.

(5) The form of the Victorian Government Certificate of Soundness is as follows:—" G.R.—Department of Agriculture, Victoria, No. . Certificate of Soundness and Approval, issued for the season (*or issued for Life as the case may be*), given in respect of the (*breed*) stallion (*name and description of stallion*) submitted for Government inspection by the owner (*name of owner*) at (*place of examination*) such horse having been found suitable for stud service and free from hereditary unsoundness and defects of conformation predisposing thereto on examination by (*signature of Examining Officer*) Veterinary Officer on the day of 19 .

(Signature).

Chief Veterinary Officer.

Issued by direction of the Minister of Agriculture.

(Signature).

Secretary for Agriculture."

(6) Two-year-old colts may be submitted for examination and a temporary certificate will be issued in respect of such as pass the examination. Such temporary certificate must not be taken to imply suitability for stud service of approval as regards type, nor is the issue of it intended as an indication of the likelihood of a certificate being issued when submitted for examination at a more mature age.

IV.—TENURE OF CERTIFICATE.

(1) Certificates issued during the seasons 1907 and 1908 are life certificates.

(2) Certificates issued during the season 1909 in respect of horses four years old and over are life certificates; those for three-year-olds are season certificates only, and the horse must be submitted for re-examination at four and five years before a life certificate will be issued.

(3) In 1910, and subsequently, only stallions *five* years old and over will be given life certificates. *Three-year-old* and *four-year-old* stallions will be certificated for the *season only*, and will be required to be submitted for *re*-examination each season *until five* years old, when a Life certificate will be issued.

(4) The Season certificate issued in respect of any horse must be handed to the Examining Officer at the time of re-examination or forwarded to the Chief Veterinary Officer before a subsequent Season certificate or a Life certificate will be issued.

(5) The Minister retains the right to at any time have a certificated stallion submitted for re-examination, and to withdraw the certificate, in the event of the animal being declared, to his satisfaction, unsound.

(*The arrangement as to tenure of certificates, set out above, provides for the introduction of the system gradually, so that no hardship will be imposed on owners. Unless in response to Ministerial request as above provided for, owners or purchasers of stallions certificated in 1907 and 1908 will not be required to submit them again. Persons who have undertaken stallion keeping since 1908 have had ample notice and have had the fullest opportunity of making themselves aware of the conditions of certification of stallions, namely—the annual examination of all horses under five years old.*)

V.—BOARD OF APPEAL.

(1) Any owner of a stallion who is dissatisfied with the refusal of a Government certificate in respect of his horse may appeal against the decision to the Minister at any time within *thirty* days of the examination, under the following conditions:—

(*a*) That the appeal be in writing and be accompanied by the lodgment of £5, such amount to be forfeited in the event of the appeal *not* being upheld, unless the Board shall for good cause otherwise direct.

(*b*) That the appeal be accompanied by an undertaking to pay any railway fares and hotel expenses incurred by the Board of Appeal in connexion with the settlement of the appeal.

(*c*) That, in the event of refusal having been on the ground of unsoundness, the appeal be accompanied by a certificate from a registered Veterinary Surgeon setting out that the horse has been found by him on examination since the refusal appealed against, to be free from all the unsoundnesses set out in Part II. of these Regulations.

(*d*) That, in the event of refusal having been on the ground of being below standard for Government approval, the appeal be accompanied by a certificate from the President and two members of the Committee of the Society under whose auspices the parade was held, setting out that in their opinion the horse is of fit and proper type, conformation, and breeding to be approved as a stud horse.

(2) On receipt of Notice of Appeal in proper form, and with the above conditions complied with, the Minister will appoint a Board of Appeal, which shall consist of :—

(*a*) In the case of appeals against refusal of certificate on the ground of unsoundness, the Chief Veterinary Officer and two practising Veterinary Surgeons.

(*b*) In the case of appeals against refusal of certificate as being below standard for Government approval, the Chief Veterinary Officer and two horsemen of repute and standing.

Such Board shall act and decide on the appeal, and its decision shall be final, and *not subject to review.*

(3) In the event of the appeal being allowed, refund shall be made of the deposit, and any expenses paid by the appellant under Clause 1 (*b*). Further, the Board may recommend to the Minister the allowance of such of the expenses of the appellant in supporting his appeal as it may consider reasonable under the circumstances of the case, and the Minister may, in his discretion, confirm the recommendation in whole or in part, whereupon allowance shall be made to the appellant accordingly.

(4) No stallion in respect of which a Government certificate is refused will be allowed to be re-submitted for examination except in the case of an appeal as herein provided for. In the event of any rejected stallion being re-submitted for examination under another name or under such circumstances as in the opinion of the Minister are calculated to mislead the Examining Officer into the belief that the horse has not previously been examined, the owner of such rejected stallion, if proved to the satisfaction of the Minister that he is responsible for such re-submission, shall be debarred from submitting any horse for examination for such period as the Minister shall determine.

NOTICE TO SECRETARIES OF AGRICULTURAL SOCIETIES.

Section "A" of the conditions to be complied with by Agricultural Societies before being eligible for participation in the annual Government grant is as follows:—

"*A.—That the awards of prizes in all classes for stallions, three years old and over, at the Society's Show must be subject to the possession by the exhibit of a Government certificate of soundness.*"

In order to comply with the above, the special attention of show secretaries is invited to the receiving of entries in stallion classes. No entry should be received unless at the time of entry the Government certificate is produced, or unless satisfactory evidence is given that a Government certificate is held by the owner in respect of the exhibit. The awarding of a prize card and the withholding of prize money in respect of any exhibit shall not be deemed as compliance with the condition. Care should be taken also to see that the certificate is not out of date, that is to say:—

For three-year-olds, a 1911 three-year-old certificate must be held.

For four-year-olds, a 1911 four-year-old certificate must be held (the 1910 three-year-old certificate is out of date).

For horses five years old and over, a life certificate must be held

Secretaries are strongly urged to become familiar with the regulations, particularly Regulation IV., which deals with the tenure of certificates.

Secretaries are required to forward immediately after the show a return (forms for which will be sent to each society) giving required particulars concerning 1st, 2nd, and 3rd prize winners as under:—

RETURN to be forwarded to the Chief Veterinary Officer concerning Stallions (3 years old and over) awarded Prizes at the.................... Agricultural Society's Show held........... ....

Name of Stallion.	Certificate Number.	Name of Class and Section (not Number).	Prize Awarded.			Owner's Name.	Owner's Address.
			1st.	2nd.	3rd.		

(Signed)..

Secretary.. .... Agricultural Society.

Date.....................

LIST OF CERTIFICATED STALLIONS, 1910-11.

CERTIFICATES ISSUED DURING SEASON 1910–11 (ENDING 31.3.1911).

(For List of Horses previously Certificated see Journal for April, 1910.)

Cert. No.	Name of Horse.	Age.*	Owner.	Parade.	Date of Examination.	Date of Expiry of Certificate.	Officer.
	DRAUGHTS.						
1753	Admiral Prince	6 years	D. T. Harty, sen.	Horsham	13.7.10	Life	W.R.
96/4	Admiral Sperry	4 years	W. Barnes	Rainbow	18.8.10	30.6.11	W.R.
313/3	Admiral Sperry	3 years	Mrs. J. Jeffrey	Melbourne	26.7.10	"	W.J.C.
83/4	Admiral Sperry	4 years	Alex. Duff	Maryborough	17.8.10	"	G.S.B.
73/2	Aerial King	2 years	C. Robertson	Horsham	13.7.10	"	W.R.
269/3	Aerial Star	3 years	C. Robertson	Horsham	13.7.10	"	W.R.
275/3	Aitken Chief	3 years	Jas. Patrick	N.Z. Govt. Cert.	30.6.10	"	
389/3	Aladdin	3 years	Geo. Muir	Bacchus Marsh	25.8.10	"	W.J.C.
302/3	Albyn	3 years	Wm. Kiddle	Agricultural Offices	23.7.10	"	R.G.
274/3	Alexander Chief	3 years	P. Mangan	N.Z. Govt. Cert.	19.5.10	"	
41/4	Arawa	4 years	Jas. Hamilton	N.Z. Govt. Cert.	23.6.10	"	
249/3	Ardgowan	3 years	Mitchell & O'Brien	Agricultural Offices	25.6.10	"	G.S.B.
1/4	Attention	4 years	Mitchell & O'Brien	Melbourne	7.6.10	"	R.G.
407/3	Attraction's Pride	3 years	W. Curtain	Rutherglen	7.9.10	"	R.G.
97/2	Australia's Favourite	2 years	W. Mahoney	Terang	13.9.10	"	W.R.
29/4	Avon More	4 years	Hugh Boyd	Melbourne	26.7.10	"	W.R.
17/4	Bancor's Heir	4 years	Jno. McCrostie	N.Z. Govt. Cert.	23.6.10	"	
1475	Bancor's Pride	5 years	Fred Hammill	N.Z. Govt. Cert.	3.7.10	Life	
314/3	Baron	3 years	M. Ewart	Melbourne	26.7.10	30.6.11	W.R.
178/4	Baron Aldie	4 years	G. and W. Lord	Sale	20.9.10	"	G.S.B.
402/3	*Baron Bombay*	3 years	Shiels Bros.	N.Z. Govt. Cert.	12.8.10	"	
220/3	Baron Branxholme	3 years	Alex. Robertson	Melbourne Special	7.6.10	"	W.R.
16/4	Baron Clinton	4 years	R. N. Herkes	N.Z. Govt. Cert.	21.6.10	"	
480/3	Baron Gardiner	3 years	F. H. Walsh	Agricultural Offices	24.9.10	"	W.R.
305/3	Baron Idadale	3 years	J. R. Stokes	Agricultural Offices	23.7.10	"	G.S.B.
216/3	Baron Irvine	3 years	Mitchell & O'Brien	Melbourne Special	7.6.10	"	W.J.C.
217/3	Baron McLeod	3 years	R. Kerr	Yering	7.6.10	"	G.S.B.
315/3	Baron of Gartlee	3 years	McCann Bros.	Melbourne	26.7.10	"	G.S.B.
30/4	*Baron Renfrew*	4 years	*J. Gray*	*Melbourne*	*26.7.10*	"	W.R.
213/3	Baron's Best	3 years	J. Glen	Agricultural Offices	5.5.10	"	R.G.
49/4	Barrow Oak	4 years	Peter Reid	Wangaratta	22.7.10	"	W.R.
218/3	Bay Ronald	3 years	Mitchell & O'Brien	Melbourne Special	7.6.10	"	G.S.B.
85/4	Belted Dawn	4 years	Jas. Ingram	Wycheproof	17.8.10	"	W.J.C.
1744	Black Morning	Aged	Hoult and Son	Agricultural Offices	30.6.10	Life	W.R.
182/4	Black Prince	4 years	Roberts Bros.	Trafalgar	27.9.10	30.6.11	G.S.B.
316/3	Black Prince	3 years	R. Black	Melbourne	26.7.10	"	G.S.B.
121/4	*Blue Harold*	4 years	W. *Price*	*Pyramid*	*26.8.10*	"	G.S.B.
1793	Blue Ribbon Ben	Aged	Hamilton *Allen*	Portland	9.8.10	Life	W.R.
396/3	Bold Lincoln	3 years	G. A. H. Pietsch	Royal Show	30.8.10	30.6.11	W.R.
97/4	Bonnie Ben	4 years	C. J. Liesfield	Rainbow	18.8.10	"	W.R.
1897	Bonnie Clifton	5 years	Hugh Gilmore	Alexandra Show	10.11.10	Life	W.J.C.
415/3	Bonnie Clyde	3 years	S. Devlin	Portland	8.9.10	30.6.11	W.R.
363/3	Bonnie Lad	3 years	A. J. Williams	Kaniva	16.8.10	"	W.R.
255/3	Bonnie Laddie	3 years	Caffrey and Murphy	Agricultural Offices	2.7.10	"	W.R.
397/3	Bonnie Scott	3 years	P. T. Darcy	Royal Show	30.8.10	"	G.S.B.
124/4	Borderside	4 years	Geo. Nield	Swan Hill	23.8.10	"	W.R.
304/3	Brantham Roll Call II.	3 years	Jno. Hall	Agricultural Offices	23.7.10	"	R.G.
1901	British Crown	5 years	A. Colvin	N.Z. Govt. Cert.	20.9.10	Life	
293/3	British Lad	3 years	J. Hamilton	Melbourne	25.7.10	30.6.11	G.S.B.
219/3	British Leader	3 years	Mitchell & O'Brien	Melbourne Special	7.6.10	"	G.S.B.
303/3	Brown Champion	3 years	Jno. Hall	Agricultural Offices	23.7.10	"	R.G.
82/2	Brown Chieftain	2 years	Walter and Agar	Melbourne	28.7.10	"	R.G.
214/3	Brown King	3 years	A. G. Cust	Agricultural Offices	28.5.10	"	W.R.
276/3	Brydon	3 years	Jas. Lawson	N.Z. Govt. Cert.	8.7.10	"	
1750	Burnside Chief	5 years	Chas. Clarke	N.Z. Govt. Cert.	20.4.10	Life	
384/3	Campbell Prince	3 years	G. Crisp	Swan Hill	23.8.10	30.6.11	W.R.
1827	Captain Edwin	Aged	J. Borger	Rushworth	26.8.10	Life	G.S.B.
81/2	Carmichael	2 years	Jno. Gooden	Melbourne	27.7.10	30.6.11	R.G.
332/3	Carlyon	3 years	Andrew Robinson	Newmarket	1.8.10	"	G.S.B.
154/4	Carol Redwood	4 years	C. H. Feldtmann	Benalla	9.8.10	"	R.G.
390/3	Cashman	3 years	Burke Bros.	Kerang	24.8.10	"	W.R.
250/3	Centrewood	3 years	Mitchell & O'Brien	Agricultural Offices	25.6.10	"	G.S.B.
252/3	Channel Flight	3 years	P. Fraser	Agricultural Offices	1.7.10	"	W.R.
365/3	Charmer Junr.	3 years	McKenzie Bros.	Rainbow	18.8.10	"	W.R.
270/3	Chieftain	3 years	Jno. McLean	Horsham	14.7.10	"	G.S.B.
1774	Clan McGregor II.	5 years	T. O'Gorman	Agricultural Offices	23.7.10	Life	R.G.
1767	Clifton	5 years	Exors., A. T. Hart	Melbourne	25.7.10	"	W.R.

* *Age is reckoned as from 1st July, 1910.*

List of Certificated Stallions—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date of Examination.	Date of Expiry of Certificate.	Officer.
			DRAUGHTS—*continued.*				
221/3	Clinton	3 years	Walter and Agar	Melbourne Special	7.6.10	30.6.11	R.G.
459/3	Clumber Baronet	3 years	M. J. Caffrey	Agricultural Offices	11.2.11	,,	R.G.
344/3	Clyde Boy	3 years	J. Walder and Sons	Watchem	10.8.10	,,	R.G.
277/3	Clyde Laddie	3 years	W. G. Down	N.Z. Govt. Cert.	23.6.10	,,	
349/3	Clydesdale Mac	3 years	J. P. Billeville	Watchem	11.8.10	,,	R.G.
105/2	Clydesdale Prince	2 years	R. C. Buchanan	Tallangatta	27.9.10	,,	R.G.
103/2	Comet	2 years	Brock Bros.	Trafalgar	27.9.10	,,	G.S.B.
74/2	Connell's Pride	2 years	A. Wohlers	Horsham	14.7.10	,,	G.S.B.
1868	Conqueror	Aged	Johnson Cobain	Sale	20.9.10	Life	G.S.B.
222/3	Conquest	3 years	Mitchell & O'Brien	Melbourne Special	7.6.10	30.6.11	G.S.B.
1810	Craigie Lea	Aged	A. Koch	Rainbow	18.8.10	Life	W.R.
1780	Craigside	5 years	A. H. Riordan	Melbourne	26.7.10	,,	R.G.
13/4	Crested Knight	4 years	W. H. Daniels	Horsham	13.7.10	30.6.11	W.R.
1103	Crown Grant	3 years	George Young	St. Arnaud	18.8.10	Life	E.A.K.
444/3	Crown Prince	3 years	A. Simon	Tallangatta	27.9.10	30.6.11	R.G.
361/3	Croydon	3 years	R. H. Lanyon	Boort	18.8.10	,,	W.J.C.
379/3	Culloden	3 years	Jno. Crawford	Echuca	23.8.10	,,	G.S.B.
442/3	Dainty Davie	3 years	J. Low	Korumburra	28.9.10	,,	W.R.
65/4	Dan	4 years	Chris. Burke	Donald	9.8.10	,,	R.G.
1904	Dandy Leary	5 years	W. W. Nash	N.Z. Govt. Cert.	—.5.10	Life	
1880	Darby	6 years	J. R. Hintz	Pakenham	28.9.10	,,	G.S.B.
271/3	Darnley	3 years	W. R. Smith	Horsham	14.7.10	30.6.11	W.R.
278/3	Deeside	3 years	Jas. Lawson	N.Z. Govt. Cert.	8.7.10	,,	
260/3	Delver	3 years	Geo. Mitchell	Agricultural Offices	9.7.10	,,	G.S.B.
1775	Dewstow Forest King	5 years	P. Connell	Melbourne	21.7.10	Life	W.R.
1748	Dominion	6 years	Robt. Watson	Agricultural Offices	9.7.10	,,	G.S.B.
425/3	Donald	3 years	Morrish Bros.	Smeaton	15.9.10	30.6.11	W.J.C.
50/4	Donald McPherson	4 years	Colin Gardner	Wangaratta	22.7.10	,,	W.R.
1862	Donald's Pride	6 years	A. Grieve	Smeaton	15.9.10	Life	W.J.C.
223/3	Douglas	3 years	Mitchell & O'Brien	Melbourne Special	7.6.10	30.6.11	R.G.
1798	Douglas Ben	Aged	M. Keogh	Birchip	11.8.10	Life	R.G.
146/4	Dreadnought	3 years	F. Metherall	Nnmurkah	6.9.10	30.6.11	G.S.B.
55/4	Dreadnought	4 years	R. Semmler	Murtoa	3.8.10	,,	R.G.
110/4	Drumcolin	4 years	Quinn Bros.	Elmore	22.8.10	,,	G.S.B.
1828	Drumflower	Aged	Jno. Archibald	Rushworth	26.8.10	Life	G.S.B.
331/3	Drummer	3 years	Anderson Bros.	Newmarket	1.8.10	30.6.11	G.S.B.
294/3	Drummer Boy	3 years	Jno. Ball	Melbourne	25.7.10	,,	W.R.
93/4	Dunmore	4 years	B. J. Hughes	Inglewood	18.8.10	,,	G.S.B.
256/3	Earl of Newton	3 years	R. Ward	Agricultural Offices	2.7.10	,,	R.G.
125/4	Earl of Redbank	4 years	J. Hayward	Swan Hill	23.8.10	,,	W.R.
15/4	Earlstone Lad	4 years	H. Edgar	Agricultural Offices	16.7.10	,,	R.G.
253/3	Earl Vallence	3 years	Mitchell & O'Brien	Agricultural Offices	30.6.10	,,	W.R.
153/4	Ettrick	4 years	Ed. Looby	Dookie	8.9.10	,,	G.S.B.
257/3	Evanyett	3 years	A. S. Warry	Agricultural Offices	2.7.10	,,	R.G.
306/3	Evelyn Lad	3 years	J. Carter	Agricultural Offices	23.7.10	,,	G.S.B.
156/4	Everlasting King	4 years	Geo. Fraser	Ballarat	10.9.10	,,	G.S.B.
81/2	Federal Fashion	2 years	T. T. Mulder	Melbourne	27.7.10	,,	G.S.B.
318/3	Federal Laddie	3 years	J. Kurtzmann	Melbourne	26.7.10	,,	G.S.B.
192/4	Federal Prince	4 years	J. Pasco	Morwell	26.9.10	,,	G.S.B.
403/3	Federal Prince	3 years	H. P. McDougall	Yarrawonga	5.9.10	,,	R.G.
383/3	Federal Star	3 years	Colin Gardner	Tatura	25.8.10	,,	G.S.B.
111/4	Federation King	4 years	D. Trewick	Elmore	22.8.10	,,	G.S.B.
1792	Field Marshall	6 years	J. Y. Wynne	Hopetoun	9.8.10	Life	W.R.
339/3	Fine View	3 years	W. T. Bodey	Murtoa	3.8.10	30.6.11	R.G.
279/3	Flash Newton	3 years	Robt. Watson	N.Z. Govt. Cert.	30.6.10	,,	
1776	Foreign Prince	6 years	C. N. Tyndall	Melbourne	21.7.10	Life	W.R.
193/4	Forest King	4 years	A. J. Ryan	Morwell	26.9.10	30.6.11	G.S.B.
108/4	Frogmore	4 years	J. Giddings	Dimboola	19.8.10	,,	W.R.
1787	Gallant Boy	Aged	—. Walder	Newmarket	2.8.10	Life	G.S.B.
1896	Gallant Knight	5 years	Albert Miller	Bacchus Marsh Special	6.11.10	,,	R.G.
1811	Gallant Prince	5 years	W. T. White	Rainbow	18.8.10	,,	W.R.
1837	Gallant Stewart	5 years	W. H. Gadd	Royal Show	2.9.10	,,	W.R.
225/3	Garthland Lad	3 years	A. Robertson	Melbourne Special	7.6.10	30.6.11	W.J.C.
1761	Garthland Prince	5 years	H. Jenks	N.Z. Govt. Cert.	8.7.10	Life	
1906	Garthland's Pride	5 years	R. Pilgram	N.Z. Govt. Cert.	28.7.10	,,	
2/4	Gay Garland	4 years	W. Russell Clarke	Melbourne Special	7.6.10	30.6.11	W.R.
319/3	Gay Lad	3 years	Phillips Bros.	Melbourne	26.7.10	,,	G.S.B.
37/4	General Cass	4 years	J. E. Small	N.Z. Govt. Cert.	2.7.10	,,	
426/3	General Hunter	3 years	R. E. MacArthur	N.Z. Govt. Cert.	30.6.10	,,	
265/3	Gentleman Chief	3 years	Jno. Gifford	Horsham	13.7.10	,,	W.R.
325/3	Gladstone	3 years	T. H. Walsh	Newmarket	2.8.10	,,	G.S.B
350/3	Glenalbyn	3 years	D. McGilp	Minyip	11.8.10	,,	W.R.

LIST OF CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date of Examination.	Date of Expiry of Certificate.	Officer.
			DRAUGHTS—*continued.*				
333/3	Glen Donald	3 years	J. Henderson	Newmarket	1.8.10	30.6.11	G.S.B.
73/4	Glenlyon ..	4 years	K. Cameron	Warracknabeal	12.8.10	,,	W.R.
1829	Glen Marshall	Aged	J. Branson	Rushworth	26.8.10	Life	G.S.B.
161/4	Glenroy ..	4 years	J. Long	Heathcote	12.9.10	30.6.11	R.G.
3/4	Glentui ..	4 years	Mitchell & O'Brien	Melbourne Special	7.6.10	,,	W.J.C.
163/4	Glenview ..	4 years	Smythe Bros.	Daylesford	12.9.10	,,	G.S.B.
22/4	Glen Wallace	4 years	J. J. Wallis	Melbourne	25.7.10	,,	R.G.
56/4	Glen William	4 years	Carl Krelle	Murtoa ..	3.8.10	,,	R.G.
307/3	Gold Reef	3 years	E. Hearn	Agricultural Offices	23.7.10	,,	G.S.B.
197/4	Grampian II.	4 years	A. Blew	Korumburra	28.9.10	,,	W.R.
1873	Grand Review	5 years	A. E. Cockram	Agricultural Offices	24.9.10	Life	W.R.
98/2	Guiding Star	2 years	J. Cowie	Werribee	17.9.10	30.6.11	W.R.
95/4	*Hamilton Star*	4 years	R. Steer	Nhill ..	17.8.10	,,	W.R.
267/3	Hampton's Fancy	3 years	W. G. Parish	Horsham	13.7.10	,,	W.R.
106/4	Hampton's Pride	4 years	F. Varcoe	Jeparit ..	18.8.10	,,	W.R.
18/4	*Harvester*	4 years	*Jas. Lawson*	N.Z. Govt. Cert. ..	8.7.10	,,	
19/4	Heather Jock	4 years	J. Manley	N.Z. Govt. Cert. ..	17.5.10	,,	
44/4	Heather King	4 years	C. Clarke	Melbourne	29.7.10	,,	W.R.
1804	Hector Albyn	5 years	G. F. and H. Leech	Inglewood	18.8.10	Life	G.S.B.
39/4	*Herd Boy*	4 years	*A. Blakie*	*Melbourne*	27.9.10	30.6.11	W.R.
71/2	Herd King	2 years	Walter and Agar	Melbourne Special	7.6.10	,,	W.R.
57/4	Hero Ben	4 years	H. C. H. Hateley	Murtoa ..	3.8.10	,,	R.G.
1872	Herod's Boy	5 years	J. Darby	Kyneton	19.9.10	Life	W.R.
1866	*Hero's Pride*	5 years	*McDonald Bros.*	*Leongatha*	21.9.10	,,	R.G.
106/2	Hiawatha	2 years	A. L. Hamilton	Corryong	28.9.10	30.6.11	R.G.
295/3	Highlander	3 years	T. Thornton	Melbourne	25.7.10	,,	W.R.
23/4	Highland Laddie	4 years	N. Ramsay	Melbourne	25.7.10	,,	R.G.
378/3	Highland Laddie	3 years	Jno. Crawford	Echuca	23.8.10	,,	G.S.B.
71/4	Highland Prince	4 years	G. Pengelly	Jeparit ..	10.8.10	,,	W.R.
416/3	Hillside Prince	3 years	C. Lippiatt	Ballarat	10.9.10	,,	G.S.B.
81/4	Ian Hamilton's Pride	4 years	F. J. Bennett	Birchip ..	11.8.10	,,	R.G.
70/4	Ian North ..	4 years	Chas. Warne	Watchem	10.8.10	,,	R.G.
280/3	Joe Horner	3 years	Andrew Chrystal	N.Z. Govt. Cert. ..	23.6.10	,,	
408/3	Jolly Native	3 years	Wm. Woods	Rutherglen	7.9.10	,,	R.G.
179/4	Kelms Pride	4 years	W. Newton	Kyneton	19.9.10	,,	W.R.
273/3	Kelvin Chief	3 years	McCann Bros.	Agricultural Offices	16.7.10	,,	R.G.
215/3	Kelvin Hero	3 years	Alex. Robertson	Agricultural Offices	28.5.10	,,	W.R.
114/4	Kingsway II.	4 years	Exrs. D. Archibald	Agricultural Offices	23.8.10	,,	G.S.B.
75/2	Kinloch's Pride	2 years	R. Carroll	Horsham	13.7.10	,,	G.S.B.
76/2	Kin's Fancy	2 years	A. Wohlers	Horsham	14.7.10	,,	G.S.B.
119/4	Kirk's Pride	4 years	Fred. Kirchhofer	Echuca ..	23.8.10	,,	G.S.B.
228/3	Kitchener	3 years	Alex. Robertson	Melbourne Special	7.6.10	,,	W.J.C.
441/3	Knight Dunmore	3 years	D. J. Kelleher	Kilmore	27.9.10	,,	W.J.C.
166/4	Knight of Kildare	4 years	E. Boland	Terang ..	13.9.10	,,	W.R.
24/4	King Alexander	4 years	Walter and Agar	Melbourne	25.7.10	,,	W.R.
386/3	King Edward	3 years	J. Currie	Shepparton	26.8.10	,,	W.R.
226/3	King Edward	3 years	Alex. Robertson	Melbourne Special	7.6.10	,,	G.S.B.
387/3	King Jimmy	3 years	J. Phillips	Shepparton	26.8.10	,,	W.R.
1764	King Khama	5 years	Andrew Chrystal	N.Z. Govt. Cert. ..	23.6.10	Life	
141/4	King of Newton	4 years	J. B. McInnes	Rutherglen	7.9.10	30.6.11	R.G.
169/4	*King of the Roses*	4 years	A. McKenzie	Werzibee	17.9.10	,,	W.R.
227/3	King of the Shepherds	3 years	W. Gould	Melbourne Special	7.6.10	,,	G.S.B.
89/2	King's Clydesdale	2 years	J. Phillips	Shepparton	26.8.10	,,	W.R.
42/4	King Thistle	4 years	J. D. Mitchell	N.Z. Govt. Cert. ..	23.6.10	,,	
130/4	King William	4 years	*Benson Bros.*	Bacchus Marsh	25.8.10	,,	W.J.C.
10/4	King William	4 years	A. W. Milne	Horsham	13.7.10	,,	W.R.
1745	Laird of Balmoral	5 years	Thos. Maddern	Agricultural Offices	2.7.10	Life	R.G.
190/4	Laird of Burnbrae	4 years	W. Cameron	Melton ..	24.9.10	30.6.11	W.J.C.
448/3	*Lal Lal* ..	3 years	A. J. *Fisken*	*Yendon*	*5.10.10*	,,	R.G.
96/2	Landlord ..	2 years	Donald McCallum	Clunes ..	13.9.10	,,	G.S.B.
282/3	Lauder Boy	3 years	Jas. Patrick	N.Z. Govt. Cert. ..	30.6.10	,,	
261/3	Leeston Yet	3 years	P. Mangan	Agricultural Offices	9.7.10	,,	G.S.B.
211/3	*Linkwood*	3 years	*Jas. and M. J. Egan*	*Agricultural Offices*	*20.4.10*	,,	W.R.
258/3	Lion King	3 years	Jno. Maloney	Agricultural Offices	2.7.10	,,	R.G.
262/3	Livingstone	3 years	W. R. Smith	Agricultural Offices	9.7.10	,,	G.S.B.
372/3	Loch Albyn	3 years	Thos. Brown	Elmore ..	22.8.10	,,	G.S.B.
241/3	Loch Lomond	3 years	Peter Rogers	Melbourne Special	7.6.10	,,	W.R.
9/4	Lorne Ruby	4 years	Ken. C. Harper	Agricultural Offices	2.7.10	,,	W.R.
414/3	Lorryman	3 years	W. Grattan	Dookie ..	8.9.10	,,	G.S.B.
1905	Lunesdale Burton	5 years	M. J. Caffrey	Agricultural Offices	28.1.11	Life	G.S.B.
457/3	Lymm Menestral	3 years	Thos. Ervine	Agricultural Offices	21.1.11	30.6.11	W.R.
201/4	Lymm Truffle	4 years	M. J. Caffrey	Agricultural Offices	28.1.11	,,	G.S.B.
92/2	Lord Ashmore	2 years	R. A. Ash	Royal Show	30.8.10	,,	W.R.

LIST OF CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date of Examination.	Date of Expiry of Certificate.	Officer.
			DRAUGHTS—*continued.*				
346/3	Lord Clyde	3 years	A. G. Sherwell	Watchem	10.8.10	30.6.11	R.G.
170/4	Lord Clyde	4 years	Jas. Daly	Werribee	17.9.10	,,	W.R.
28/4	Lord Craig	4 years	S. Clarke	Melbourne	26.7.10	,,	G.S.B.
443/3	Lord Dudley	3 years	A. Thomson	Korumburra	28.9.10	,,	W.R.
296/3	Lord Erskine	3 years	E. Roberts	Melbourne	25.7.10	,,	R.G.
446/3	Lord Galloway	3 years	R. G. Kiell	Corryong	28.9.10	,,	R.G.
435/3	Lord Glencairn	3 years	R. Gilby	Melton	24.9.10	,,	W.J.C.
136/4	Lord Glengyle	4 years	Robt. Allen	Royal Show	30.8.10	,,	R.G.
393/3	Lord Glenzier	3 years	Mitchell & O'Brien	Royal Show	2.9.10	,,	R.G.
281/3	Lord Haldon	3 years	Bealey Bros.	N.Z. Govt. Cert.	13.4.10	,,	
342/2	Lord Hopetoun	3 years	Patrick Sullivan	Donald	9.8.10	,,	R.G.
437/3	Lord Jock	3 years	W. J. Wilson	Korumburra	28.9.10	,,	W.R.
405/3	Lord Kelvin	3 years	Jno. Flanagan	Yarrawonga	5.9.10	,,	R.G.
1858	Lord Kenilworth	5 years	Dr. J. G. Wilson	Koroit	15.9.10	Life	W.R.
263/3	Lord Leeston	3 years	H. Doidge	Agricultural Offices	9.7.10	30.6.11	G.S.B.
284/3	Lord Lindsay	3 years	A. Chrystal	N.Z. Govt. Cert.	23.6.10	,,	
283/3	Lord Newton	3 years	Jas. Patrick	N.Z. Govt. Cert.	30.6.10	,,	
1741	Lord Northcote	6 years	Jno. Dugdale	Agricultural Offices	17.5.10	Life	W.R.
375/3	Lord Northcote	3 years	T. Trevaskis	Kyabram	23.8.10	30.6.11	G.S.B.
4/4	Lord of the Isles	4 years	Alex. Robertson	Melbourne Special	7.6.10	,,	G.S.B.
12/4	Lord Sheffield	4 years	Walter and Agar	Horsham	13.7.10	,,	W.R.
5/4	Macauley	4 years	Mitchell & O'Brien	Agricultural Offices	25.6.10	,,	G.S.B.
8/4	McLeish	4 years	W. Crozier	Agricultural Offices	2.7.10	,,	R.G.
272/3	Mac's Fancy	3 years	Geo. W. Francis	Horsham	15.7.10	,,	G.S.B.
1822	Maitland	Aged	W. J. Bertalli	Castlemaine	23.8.10	Life	R.G.
388/3	Major	3 years	E. Walker	Shepparton	26.8.10	30.6.11	W.R.
186/4	Major	4 years	Delatite Property Coy. Ltd.	Mansfield	23.9.10	,,	W.J.C.
297/3	Major II.	3 years	J. Hamilton	Melbourne	25.7.10	,,	G.S.B.
175/4	Major Gordon	4 years	Peter McIntosh	Colac	15.9.10	,,	G.S.B.
177/4	Major Mac	4 years	Stuckey Bros.	Traralgon	21.9.10	,,	G.S.B.
380/3	Major Style	3 years	C. Hall	Echuca	23.8.10	,,	G.S.B.
1847	Marshal Neil	Aged	C. C. Morley	Rutherglen	7.9.10	Life	R.G.
195/4	Master Watty	4 years	Brock Bros.	Trafalgar	27.9.10	30.6.11	G.S.B.
351/3	Maud's Chief	3 years	R. Sweetman	Minyip	11.8.10	,,	W.R.
1756	Mayflower	5 years	G. McQueen	Horsham	14.7.10	Life	W.R
102/4	Mayflower	4 years	T. Larcombe	Geelong	18.8.10	30.6.11	R.G.
185/4	Mellington Colonel II.	4 years	T. O'Donohue	Bunyip	27.9.10	,,	W.R.
285/3	Merry Lad	3 years	Jno. Grant	N.Z. Govt. Cert.	23.6.10	,,	
127/4	Merry Prince	4 years	G. Pearse	Swan Hill	23.8.10	,,	W.R.
1878	Meteor	5 years	J. Cable	Agricultural Offices	30.9.10	Life	W.R.
212/3	Middlemarch	3 years	J. and M. J. Egan	Agricultural Offices	20.4.10	30.6.11	W.R.
229/3	Milton's Pride	3 years	Patrick Downes	Melbourne Special	7.6.10	,,	R.G.
1865	Model	Aged	J. Bird	Yarram	19.9.10	Life	R.G.
95/2	Model King	2 years	J. Stokes	Ballarat	10.9.10	30.6.11	G.S.B.
230/3	Montgomery	3 years	C. S. B. McFarlane	Melbourne Special	7.6.10	,,	R.G.
109/2	Mountain Robin	2 years	Jas. Galloway	Ballarat Show	17.11.10	,,	R.G.
1879	Muir Lad	Aged	E. Greaves	Cranbourne	29.9.10	Life	G.S.B.
381/3	Napoleon	3 years	C. Marfleet	Pyramid	25.8.10	30.6.11	R.G.
74/4	Newton Stewart	4 years	G. D'Ebro	Warracknabeal	12.8.10	,,	W.R.
287/3	Newton's Sensation	3 years	J. Meiklejohn	N.Z. Govt. Cert.	30.6.10	,,	
286/3	Newton's Style	3 years	Jas. Patrick	N.Z. Govt. Cert.	30.6.10	,,	
308/3	Oak Branch II.	3 years	Jno. Hall	Agricultural Offices	23.7.10	,,	G.S.B.
1832	Oaklands	Aged	Anderson and Coy.	Bacchus Marsh	25.8.10	Life	W.J.C.
289/3	Officer's Pride	3 years	Andrew Chrystal	N.Z. Govt. Cert.	23.6.10	30.6.11	
231/3	Oliver Twist	3 years	Ingram Bros.	Melbourne Special	7.6.10	,,	W.J.C.
131/4	One O'clock	4 years	D. Robertson	Bacchus Marsh	25.8.10	,,	W.J.C.
94/4	Orbost Oak	4 years	J. and C. Wallace	Kaniva	16.8.10	,,	W.R.
165/4	Orphan Boy	4 years	J. Burns	Euroa	13.9.10	,,	R.G.
288/3	Otahuti Jock	3 years	H. Jenks	N.Z. Govt. Cert.	8.7.10	,,	
232/3	Otantau	3 years	Alex. Robertson	Melbourne Special	7.6.10	,,	R.G.
233/3	Parkside	3 years	Mitchell & O'Brien	Melbourne Special	7.6.10	,,	G.S.B.
75/4	Patrician	4 years	Roderick McKenzie	Warracknabeal	12.8.10	,,	W.R.
234/3	Patrick's Pride	3 years	A. Cameron	Melbourne Special	7.6.10	,,	W.R.
264/3	Patron's Hope	3 years	Frank Mentha	Horsham	13.7.10	,,	G.S.B.
99/2	Patron's Pride	2 years	W. Cowley	Colac	15.9.10	,,	G.S.B.
47/4	Peerless	4 years	J. T. Clarke	Newmarket	2.8.10	,,	G.S.B.
364/3	Percy's Hero	3 years	J. Vennell	Kaniva	16.8.10	,,	W.R.
23/4	Pimpernel	4 years	G. Parker	Melbourne	26.7.10	,,	W.R.
1869	Ploughboy	6 years	J. W. Tregear	Mirboo North	23.9.10	Life	G.S.B.
392/3	Powisland Blue Blood II.	3 years	D. J. Milne	Kerang	24.8.10	30.6.11	W.R.
122/4	Powisland Pure Blood	4 years	Chas. Mills	Pyramid	25.8.10	,,	R.G.

List of Certificated Stallions—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date of Examination.	Date of Expiry of Certificate.	Officer.
	Draughts—*continued.*						
101/2	Premier	2 years	G. and W. Lord ..	Sale	20.9.10	30.6.11	G.S.B.
1748	*Premier Craig of Willow Bank*	5 years	J. H. Meyer ..	*Agricultural Offices*	17.5.10	Life	W.R.
20/4	Premier Ward ..	4 years	Chas. Clarke ..	N.Z. Govt. Cert. .	20.4.10	30.6.11	
1766	Premier Yet ..	5 years	Jno. Burns ..	N.Z. Govt. Cert. ..	30.6.10	Life	
100/2	President	2 years	G. and W. Lord	Sale	20.9.10	30.6.11	G.S.B.
1785	Pride of Albyn ..	6 years	W. McAlpine ..	Newmarket ..	1.8.10	Life	R.G.
115/4	Pride of Lochiel ..	4 years	J. T. Ovens ..	Kyabram ..	23.8.10	30.6.11	G.S.B.
235/3	Pride of Melrose ..	3 years	S. H. Malseed ..	Melbourne Special	7.6.10	,,	G.S.B.
104/2	Pride of Milton ..	2 years	M. Cochrane ..	Melton	24.9.10	,,	W.J.C.
327/3	Pride of Milton ..	3 years	Jas. McKenna ..	N.Z. Govt. Cert. ..	9.6.10	,,	
254/3	Pride of the Garroch	3 years	P. Fraser ..	Agricultural Offices	30.6.10	,,	W.R.
1871	Pride of the Heroes	5 years	S. Marshall ..	Yea	22.9.10	Life	W.J.C.
84/4	Prince Albert II. ..	4 years	F. Berger ..	Maryborough ..	17.8.10	30.6.11	G.S.B.
25/4	Prince Avon ..	4 years	W. A. Croxford ..	Melbourne ..	25.7.10	,,	G.S.B.
433/3	Prince Burns ..	3 years	J. Langford ..	Warragul ..	26.9.10	,,	W.R.
72/2	Prince Cedric ..	2 years	Walter and Agar..	Melbourne Special	7.6.10	,,	G.S.B.
321/3	Prince Champion ..	3 years	H. Doidge ..	Melbourne ..	26.7.10	,,	G.S.B.
92/4	Prince Charlie ..	4 years	Chas. Umbers ..	Sea Lake ..	15.8.10	,,	W.J.C
150/4	Prince Edward ..	4 years	J. M. Gardiner ..	Wangaratta ..	8.9.10	,,	R.G.
420/3	Prince George ..	3 years	W. T. Manifold ..	Camperdown ..	14.9.10	,,	W.R.
336/3	Prince Laddie ..	3 years	Chas. Chick ..	Wangaratta ..	22.7.10	,,	W.R.
1863	*Prince Lawrence* ..	*Aged*	*Richard Williams*	*Agricultural Offices*	*17.9.10*	*Life*	*R.G.*
290/3	Prince Newton ..	3 years	W. G. Down ..	N.Z. Govt. Cert. ..	30.6.10	30.6.11	
14/4	Prince Percival ..	4 years	W. Langley ..	Horsham ..	14.7.10	,,	G.S.B.
21/4	Prince Royal ..	4 years	K. M. Matheson ..	N.Z. Govt. Cert. ..	17.5.10	,,	
1848	Protector	Aged	Jno. Hiskins ..	Rutherglen ..	7.9.10	Life	R.G.
406/3	Ranfurley ..	*3 years*	*Jno. Blackwood* ..	*Yarrawonga* ..	*5.9.10*	*30.6.11*	R.G.
6/4	Record Breaker ..	4 years	Mitchell & O'Brien	Agricultural Offices	25.6.10	,,	G.S.B.
236/3	Red Ensign ..	3 years	Jno. Ervine, sen.	Melbourne Special	7.6.10	,,	G.S.B.
1746	Ringmaster ..	5 years	Chas. Thomas ..	Agricultural Offices	2.7.10	Life	R.G.
237/3	Rising Sun ..	3 years	Jas. Gildea ..	Melbourne Special	7.6.10	30.6.11	G.S.B.
79/2	*Riverina*	2 years	*T. H. Dunn* ..	*Melbourne* ..	25.7.10	,,	R.G.
151/4	Robin Hood ..	4 years	O'Keefe Bros. ..	Wangaratta ..	8.9.10	,,	R.G.
299/3	Royal Bay ..	3 years	J. D. Rathjen ..	Melbourne ..	25.7.10	,,	G.S.B.
1816	Royal Bob ..	6 years	Ed. Glasheen ..	Boort	18.8.10	Life	W.J.C.
422/3	Royal Boy ..	3 years	J. Mahony ..	Koroit ..	15.9.10	30.6.11	W.R.
370/3	Royal Charlie ..	3 years	Donaldson Bros.	Charlton ..	19.8.10	,,	G.S.B.
77/2	Royal Chieftain ..	2 years	W. G. Parish ..	Horsham ..	13.7.10	,,	W.R.
91/4	Royal Conqueror ..	4 years	J. Millstead ..	Sea Lake ..	15.8.10	,,	W.J.C.
1765	Royal Crown ..	5 years	P. Mangan ..	N.Z. Govt. Cert. ..	19.5.10	Life	
34/4	Royal Dandy ..	4 years	Robt. Allen ..	Melbourne ..	26.7.10	30.6.11	R.G.
421/3	Royal Fashion ..	3 years	Ed. Cuthbert ..	Camperdown ..	14.9.10	,,	W.R.
172/4	Royal Favourite ..	4 years	M. O'Keefe ..	Koroit	15.9.10	,,	W.R.
428/3	Royal Gift ..	3 years	S. Clarke ..	Kyneton ..	19.9.10	,,	W.R.
78/2	Royal King ..	2 years	Walter and Agar..	Horsham ..	13.7.10	,,	W.R.
1892	Royal Monarch ..	Aged	Bernard Gannon	Penshurst ..	11.10.10	Life	R.G.
52/4	Royal Moore ..	4 years	D. F. Hourigan ..	Wangaratta ..	22.7.10	30.6.11	W.R.
107/4	Royal Nugget ..	4 years	H. McGurk ..	Charlton ..	19.8.10	,,	G.S.B.
409/3	Royal Park ..	3 years	T. Oliver ..	Rutherglen ..	7.9.10	,,	R.G.
238/3	Royal Prince ..	3 years	Alex. Robertson ..	Melbourne Special	7.6.10	,,	R.G.
322/3	Rythdale Hero ..	3 years	G. Stokes ..	Melbourne ..	26.7.10	,,	W.R.
338/3	Salisbury Hero ..	3 years	A. and. J. Rankin	N.Z. Govt. Cert. ..	9.6.10	,,	
300/3	Sandy McClusky ..	3 years	E. Roberts ..	Melbourne ..	25.7.10	,,	R.G.
358/3	Sandy McNab ..	3 years	H. S. McFarlane..	Wycheproof ..	17.8.10	,,	W.J.C.
53/4	Sandy's Heir ..	4 years	R. J. Mason ..	Wangaratta ..	22.7.10	,,	W.R.
418/3	Scotland's Fancy ..	3 years	Jno. Mills ..	Ballarat ..	10.9.10	,,	G.S.B.
98/4	Scotland's Fancy ..	4 years	D. Lamb ..	*Geelong* ..	*18.8.10*	,,	R.G.
1789	Scotland Yet ..	4 years	W. Smith ..	*Agricultural Offices*	2.5.10	Life	E.A.K.
152/4	Scottish King ..	4 years	Geo. Luckie ..	Wangaratta ..	8.9.10	30.6.11	R.G.
1782	Seafield Prince ..	Aged	J. Gray ..	Melbourne ..	27.7.10	Life	W.R.
432/3	Searchlight ..	3 years	W. W. Herbert ..	Warragul ..	26.9.10	30.6.11	W.R.
26/4	Shepherd	4 years	J. Liddle ..	Agricultural Offices	23.7.10	,,	G.S.B.
323/3	*Shepherd Boy* ..	3 years	*B. Brosnan* ..	*Melbourne* ..	26.7.10	,,	G.S.B.
239/3	Shepherd Chief ..	3 years	P. T. Gildea ..	Melbourne Special	7.6.10	,,	G.S.B.
325/3	Shepherd's Best ..	3 years	F. Tongs ..	Melbourne ..	27.7.10	,,	W.R.
440/3	Signaller	3 years	H. E. Mapleson ..	Lang Lang ..	23.9.10	,,	R.G.
202/4	Solomon IV. ..	4 years	M. J. Caffrey ..	Agricultural Offices	28.1.11	,,	R.G.
107/2	*Son of Champion* ..	2 years	*Turner Bros.* ..	Preston ..	31.10.10	,,	G.S.B.
399/3	Southern Cross ..	3 years	Parsons&Robertson	Royal Show ..	30.8.10	,,	W.R.
1772	Sproughton Warrior	6 years	P. H. Morton ..	Melbourne ..	25.7.10	Life	G.S.B.

LIST OF CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date of Examination.	Date of Expiry of Certificate.	Officer.
	DRAUGHTS—*continued.*						
352/3	St. Alban's	3 years	G. Goods	Minyip	11.8.10	30.6.11	W.R.
117/4	Star	4 years	C. and R. Watson	Kyabram	23.8.10	,,	G.S.B.
301/3	Stewart's Fancy	3 years	N. Ramsay	Melbourne	25.7.10	,,	R.G.
434/3	Stirling Castle	3 years	R. V. Colliver	Lang Lang	23.9.10	,,	R.G.
410/3	Sullivan's Fancy	3 years	W. H. England	Rutherglen	7.9.10	,,	R.G.
374/3	Sunflower	3 years	Donald Kennedy	Rochester	22.8.10	,,	G.S.B.
413/3	Sweet William	3 years	George Smith	Wangaratta	8.9.10	,,	R.G.
449/3	Sir Bryan	3 years	O. J. Lynn	Orbost	4.10.10	,,	G.S.B.
76/4	Sir Charles	4 years	J. R. Stokes	Warracknabeal	12.8.10	,,	W.R.
328/3	Sir Garnet	3 years	D. McCulloch	N.Z. Govt. Cert.	23.6.10	,,	
180/4	Sir Hector	4 years	J. J. Holmes	Kyneton	19.9.10	,,	W.R.
88/4	Sir Isaac Newton	4 years	McDonald & Sons	St. Arnaud	16.8.10	,,	G.S.B.
137/4	Sir Jno. McFarlane	4 years	C. Simon	Royal Show	2.9.10	,,	R.G.
292/3	Sir Patrick	3 years	Bealey Bros.	N.Z. Govt. Cert.	13.4.10	,,	
266/3	Sir Percival Junr.	3 years	G. Hicks	Horsham	13.7.10	,,	W.R.
1807	Sir Simon II.	6 years	H. Saunders	Kaniva	16.8.10	Life	W.R.
63/4	*Sir Simon Percival*	*4 years*	*H. Naylor*	*Beulah*	*9.8.10*	*30.6.11*	W.R.
240/3	Sir William	3 years	Mitchell & O'Brien	Melbourne Special	7.6.10	,,	G.S.B.
251/3	Taieri Knight	3 years	Walter and Agar	Agricultural Offices	30.6.10	,,	W.R.
424/3	Tameriskine	3 years	R. O. Wilson	Colac	15.9.10	,,	G.S.B.
309/3	Tam McKenzie	3 years	V. C. Reid	Agricultural Offices	23.7.10	,,	R.G.
368/3	Tam O'Connell	3 years	H. Carr	Charlton	19.8.10	,,	G.S.B.
105/4	Tarquin Junr.	4 years	G. Beansch	Geelong	18.8.10	,,	R.G.
243/3	Timaru	3 years	Mitchell & O'Brien	Melbourne Special	7.6.10	,,	R.G.
158/4	Tongala	4 years	J. J. Downey	Ballarat	10.9.10	,,	G.S.B.
244/3	Topmast	2 years	Jas. Gildea	Melbourne Special	7.6.10	,,	R.G.
324/3	Trafalgar	3 years	J. T. Gibson	Melbourne	27.7.10	,,	W.R.
181/4	True Blue	4 years	J. Strawhorn	Kyneton	19.9.10	,,	W.R.
248/3	True Scott	3 years	W. McKnight	Agricultural Offices	25.6.10	,,	G.S.B.
177/3	Tweedside Again	5 years	R. Kay	Melbourne	25.7.10	Life	W.J.C.
242/3	The Banner	3 years	Mitchell & O'Brien	Melbourne Special	7.6.10	30.6.11	W.J.C.
138/4	The Clydesdale	4 years	S. Williams & Sons	Yarrawonga	5.9.10	,,	R.G.
36/4	The Dandy	4 years	C. G. McMahon	Melbourne	26.7.10	,,	R.G.
102/2	The Gift	2 years	W. Foubister	Romsey	20.9.10	,,	W.R.
58/4	The Macdonald	4 years	A. Wolhars	Murtoa	3.8.10	,,	R.G.
129/4	The Standard	4 years	Mess Bros.	Agricultural Offices	27.8.10	,,	G.S.B.
77/4	The Workman	4 years	A. Arnold	Warracknabeal	12.8.10	,,	W.R.
291/3	Union Jack	3 years	Jas. Lawson	N.Z. Govt. Cert.	8.7.10	,,	
429/3	Uxbridge Fyvie	3 years	Glenn Bros.	Kyneton	19.9.10	,,	W.R.
38/4	Van Dieman	4 years	A. McDonald	Melbourne Special	7.6.10	,,	R.G.
1754	Victor	6 years	F. Fisher	Horsham	13.7.10	Life	W.R.
329/3	Waikato	3 years	G. H. Hill	N.Z. Govt. Cert.	23.6.10	30.6.11	
259/3	Wallace	3 years	Caffrey and Murphy	Agricultural Offices	2.7.10	,,	W.R.
341/3	Wally	3 years	W. E. Boulton	Hopetoun	9.8.10	,,	W.R.
48/4	Waltham	4 years	McCartney Bros.	Newmarket	2.8.10	,,	G.S.B.
268/3	Warkworth	3 years	R. Carroll	Horsham	13.7.10	,,	G.S.B.
246/3	Warrimoo	3 years	Mitchell & O'Brien	Melbourne Special	7.6.10	,,	G.S.B.
1805	Whakanui	5 years	N. Ramsay	Inglewood	18.8.10	Life	G.S.B.
110/2	Whitechurch Swell	2 years	M. J. Caffrey	Agricultural Offices	11.2.11	30.6.11	R.G.
1808	William Wallace	Aged	B. Lavery	Kaniva	16.8.10	Life	W.R.
89/4	Windermere	4 years	Jno. Gifford	St. Arnaud	16.8.10	30.6.11	G.S.B.
7/4	Young Bancor	4 years	M. Caffrey	Agricultural Offices	18.6.10	,,	W.R.
11/4	Young Bonaparte	4 years	Thos. Gregory	Horsham	13.7.10	,,	W.R.
1809	Young Crown and Feather	4 years	J. G. Haebick	Horsham	14.7.09	Life	W.J.C.
334/3	Young Donald	3 years	—. Muir	Newmarket	1.8.10	30.6.11	G.S.B.
94/2	Young Dundonald	2 years	W. Williamson	Wangaratta	8.9.10	,,	R.G.
64/4	Young Dundonald	4 years	L. A. Schneider	Beulah	9.8.10	,,	W.R.
148/4	Young Federation	4 years	H. J. Hansen	Numurkah	6.9.10	,,	G.S.B.
353/3	Young Fortune Teller	3 years	J. Graham	Minyip	11.8.10	,,	W.R.
326/3	Young Harrington	3 years	J. W. Tenney	Melbourne	27.7.10	,,	G.S.B.
1752	Young Hero's Pride	5 years	Chas. Mason	Horsham	13.7.10	Life	G.S.B.
1812	Young Highland Hero	5 years	H. Christian	Rainbow	18.8.10	,,	W.R.
196/4	Young Highland Lad	4 years	N. G. Martin	Trafalgar	27.9.10	30.6.11	G.S.B.
382/3	Young Hopstoun	3 years	Fehring and Sons	Pyramid	25.8.10	,,	R.G.
85/2	Young Kelmscott	2 years	Thos. Bellett	Donald	9.8.10	,,	R.G.
91/2	Young King	2 years	E. G. Denyer	Kerang	24.8.10	,,	W.R.
347/3	Young Lord Eggleton	3 years	H. Ovens	Watchem	10.8.10	,,	R.G.
144/4	Young Peer	4 years	Jas. McKimmie	Agricultural Offices	10.9.10	,,	R.G.
1844	Young Sensation	Aged	S. Heard	Cobram	5.9.10	Life	G.S.B.
247/3	Young Shepherd King	3 years	Alex. Robertson	Melbourne Special	7.6.10	30.6.11	G.S.B.
1870	Young Victor's Model	6 years	A. Malcolm	Mirboo North	23.9.10	Life	G.S.B.

LIST OF CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date of Examination.	Date of Expiry of Certificate.	Officer.
			LIGHTS.				
1813	Ægyptus	Aged	Pat. Barrington	Geelong	18.8.10	Life	R.G.
128/4	Agathos	4 years	Dr. Florance	Shepparton	26.8.10	30.6.11	W.R.
113/4	Ajax	4 years	J. T. Ovens	Kyabram	23.8.10	"	G.S.B.
355/3	Almont B.	3 years	F. W. Schickerling	Warracknabeal	12.8.10	"	W.R.
1797	Alone	6 years	H. McClure	Birchip	11.8.10	Life	R.G.
343/3	Ariel	3 years	T. H. Colyer	Goroke	10.8.10	30.6.11	G.S.B.
419/3	*Arrel*	3 years	Jno. Dempster	Heathcote	12.9.10	"	R.G.
395/3	Australia	3 years	A. Vinnecombe	Royal Show	30.8.10	"	G.S.B.
1853	Barmah	5 years	J. Pearse	Nathalia	7.9.10	Life	G.S.B.
411/3	Baurchier	3 years	Baurchier	Numurkah	6.9.10	30.6.11	G.S.B.
61/4	Blunder	4 years	T. H. Hatcher	Hopetoun	9.8.10	"	W.R.
1826	*Bonnie Direct*	6 years	*N. MacDonald*	*Swan Hill*	*23.8.10*	Life	W.R.
149/4	Brilliant	4 years	C. and E. Cameron	Condah	7.9.10	30.6.11	W.R.
99/4	Caimantine	4 years	S. Wrathall	Geelong	18.10.10	"	R.G.
348/3	Claredo	3 years	O'Donell Bros.	Birchip	11.8.10	"	R.G.
1831	Clark's Harold	Aged	W. J. Stretton	Agricultural Offices	27.8.10	"	G.S.B.
453/3	*Cobalt*	3 years	*H. G. Collier*	*Alexandra Show*	*10.11.10*	"	W.J.C.
1747	Commandant	6 years	S. Clarke	Agricultural Offices	9.7.10	"	G.S.B.
155/4	Cosmopolitan	4 years	Andrew Wade	Ballarat	10.9.10	"	G.S.B.
1893	Dalesman	Aged	Richd. Hustler	Penshurst	11.10.10	Life	R.G.
360/3	Decorator	3 years	F. Jennings	Inglewood	18.8.10	30.6.11	G.S.B.
1760	Del Pasa II.	5 years	Jas. Lawson	N.Z. Govt. Cert.	2.7.10	Life	
90/2	Direct Special	2 years	P. Pay	Kerang	24.8.10	30.6.11	W.R.
1742	Eaglemont	6 years	S. Prout	Newmarket	21.4.10	Life	W.R.
88/2	Earl Harold	2 years	D. Gerrand	Swan Hill	23.8.10	30.6.11	W.R.
1864	Electioneer	Aged	Walter Christensen	Yarram	19.9.10	Life	R.G.
100/4	Emulation	4 years	A. McFarlane	Geelong	18.8.10	30.6.11	R.G.
51/4	Ercildoon Dick	4 years	Colin Gardner	Wangaratta	21.7.10	"	W.R.
87/4	Fashion Direct	4 years	T. F. Hogan	Quambatook	16.8.10	"	R.G.
187/4	Fitz Bell	4 years	G. W. Booth	Frankston	24.9.10	"	R.G.
1859	Galty More	Aged	M. Piggott	Koroit	15.9.10	Life	W.R.
37/4	General Cass	4 years	J. E. Small	N.Z. Govt. Cert.	28.6.10	30.6.11	
345/3	General Cleve	3 years	P. Hayes	Watchem	10.8.10	"	R.G.
45/4	Glendon	4 years	A. Selman	Newmarket	1.8.10	"	R.G.
1817	Gold Dust	Aged	W. Ross	Dimboola	19.8.10	Life	W.R.
183/4	Governor Dixie	4 years	J. Heffernan	Kilmore	27.9.10	30.6.11	W.J.C.
79/4	Granger's Pride	4 years	E. Finkemeyer	Minyip	11.8.10	"	W.R.
1762	Halfpenny Short	Aged	Jas. Patrick	N.Z. Govt. Cert.	30.6.10	Life	
101/4	Happy Bells	4 years	F. Cox	Geelong	18.8.10	30.6.11	R.G.
191/4	Harkaway	4 years	M. Harper	Warragul	26.9.10	"	W.R.
1857	Harold Bell Boy	Aged	C. Lancaster	Werribee	17.9.10	Life	W.R.
126/4	Honest	4 years	W. J. Gillard	Swan Hill	23.8.10	30.6.11	W.R.
427/3	Honest Laddie	3 years	Grant Bros.	Kyneton	19.9.10	"	W.R.
1770	Honest Robin	Aged	H. H. Hankins	Melbourne	25.7.10	Life	G.S.B.
359/3	Huon's Honesty	3 years	Geo. Davis	St. Arnaud	16.8.10	30.6.11	G.S.B.
417/3	*Jack Huon*	3 years	*P. Donovan*	*Ballarat*	*10.9.10*	"	G.S.B.
385/3	Jack Swindle	3 years	Dr. Florance	Shepparton	26.8.10	"	W.R.
1791	Jock Ostrich	5 years	T. H. Peters	Ararat	9.8.10	Life	G.S.B.
391/3	Joy Bells	3 years	M. Peacock	Kerang	24.8.10	30.6.11	W.R.
1763	Kia Ora	Aged	Chas. Clarke	N.Z. Govt. Cert.	20.4.10	Life	
62/4	King Almont	4 years	J. Scott *Lyons*	*Beulah*	*9.8.10*	*30.6.11*	W.R.
1836	King of the Ring	Aged	Mick Melville	Geelong	18.8.10	Life	R.G.
1814	King Osterley	Aged	G. Anderson	Geelong	18.8.10	Life	R.G.
455/3	King Spring	3 years	W. McDonald	Kyneton Show	17.11.10	30.6.11	W.R.
1895	King William	6 years	J. B. Zander	Agricultural Offices	29.10.10	Life	W.R.
86/2	Maori King	2 years	Luke Strickland	Geelong	18.8.10	*30.6.11*	R.G.
356/3	Millionaire	3 years	J. Rossiter	Warracknabeal	12.8.10	"	W.R.
1890	Morcombe	Aged	T. Munday	Orbost	4.10.10	Life	G.S.B.
1749	Murray Star	5 years	W. E. Rosling	Agricultural Offices	9.7.10	"	W.R.
1824	Neptune	5 years	R. R. Coakes	Bendigo	24.8.10	"	R.G.
398/3	Oakwood	3 years	Jno. T. Folland	Royal Show	30.8.10	30.6.11	R.G.
27/4	October	4 years	J. A. Dundas	Melbourne	26.7.10	"	G.S.B.
194/4	Orderly	4 years	W. E. Gibson	Morwell	26.9.10	"	G.S.B.
1894	Osterley, M.	5 years	J. Cockbill	Agricultural Offices	22.10.10	Life	R.G.
162/4	Ostermeyer Direct	4 years	W. Montgomery	Daylesford	12.9.10	30.6.11	G.S.B.
377/3	Owyhee Chief	3 years	Geo. Showell	Castlemaine	23.8.10	"	R.G.
447/3	Prince Douglas	3 years	Mrs. Clara White	Agricultural Offices	1.10.10	"	W.R.
164/4	Prince Harold	4 years	Albert Pardon	Daylesford	12.9.10	"	G.S.B.
458/3	Prince Harold Boy	3 years	Love, Royle, and Thurgood	Agricultural Offices	3.2.11	"	W.R.
1751	Rally	6 years	A. Kyle	Agricultural Offices	9.2.10	Life	G.S.B.
1794	Regained	Aged	J. T. Howard	Donald	9.8.10	"	R.G.
188/4	Richard Cleve	4 years	Henry Doig	Dandenong	29.9.10	30.6.11	W.R.

LIST OF CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date of Examination.	Date of Expiry of Certificate.	Officer.
	LIGHTS—*continued.*						
176/4	Ringer	4 years	Hutchison & Barrie	Agricultural Offices	17.9.10	30.6.11	R.G.
146/4	Rockfeller	4 years	D. McLeod	Kyabram	23.8.10	,,	G.S.B.
450/3	Settler	3 years	P. Young	Mildura	6.10.10	,,	W.R.
1850	Silver Bell	5 years	J. Eddy	Numurkah	6.9.10	Life	G.S.B.
160/4	Splendour	4 years	J. McKenna	Nathalia	7.9.10	30.6.11	G.S.B.
376/3	Sportshuon	3 years	J. T. Ovens	Kyabram	23.8.10	,,	G.S.B.
171/4	Standish Direct	4 years	W. Walter	Werribee	17.9.10	,,	W.R.
1786	Star of Fashion	Aged	W. E. Rosling	Newmarket	1.8.10	Life	G.S.B.
104/4	St. Bernard	4 years	Ed. Myles	Geelong	18.8.10	30.6.11	R.G.
400/3	Sunny Jim	3 years	J. T. Blood	Royal Show	30.8.10	,,	G.S.B.
412/3	Sir Hampden	3 years	J. H. Fraser	Numurkah	6.9.10	,,	G.S.B.
1886	Terminus	5 years	Stephen Carkeek	Wodonga	26.9.10	Life	R.G.
200/4	Tracey Boy	4 years	Turner Bros.	Preston Special	31.10.10	30.6.11	G.S.B.
1830	Tromantana	Aged	G. Clark	Rushworth	26.8.10	Life	G.S.B.
1841	The Count	5 years	J. A. Johnston	Royal Show	30.8.10	,,	G.S.B.
1757	The Golfer	Aged	Mrs. C. Turner	Agricultural Offices	16.7.10	,,	R.G.
1796	The Nipper	5 years	J. F. Cleary	Watchem	10.8.10	,,	R.G.
1842	The Squire	5 years	J. A. Johnston	Royal Show	30.8.10	,,	G.S.B.
340/3	Urbanity	3 years	N. A. McSwan	Hopetoun	9.8.10	30.6.11	W.R.
1846	Victory	Aged	G. Turnbull	Coleraine	6.9.10	Life	W.R.
371/3	Vincent	3 years	J. McKenzie	Dimboola	19.8.10	30.6.11	W.R.
1823	Von Osterley	6 years	A. E. Burridge	Echuca	23.8.10	Life	G.S.B.
401/3	Weeho	3 years	W. D. McFarlane	Royal Show	30.8.10	30.6.11	G.S.B.
54/4	Welsh Boy	4 years	J. Slater	Wangaratta	22.7.10	,,	W.R.
78/4	W.F.A.	4 years	W. Brown	Warracknabeal	12.8.10	,,	W.R.
1802	Why Not	5 years	D. Holden	Sea Lake	15.8.10	Life	W.J.C.
1795	W. W. Estell	Aged	R. C. Hannah	Donald	9.8.10	,,	R.G.
357/3	Young Almont R.	3 years	J. Mitchell	Warracknabeal	12.8.10	30.6.11	W.R.
354/3	Young Harold	3 years	A. B. Frauenfelder	Minyip	11.8.10	,,	W.R.
173/4	Young Osterley	4 years	G. Atchison	Koroit	15.9.10	,,	W.R.
123/4	Young Tenant	4 years	G. W. Coad	Pyramid	25.8.10	,,	R.G.
1758	Zecchino	Aged	Jno. Grant	Agricultural Offices	16.7.10	Life	R.G.
	THOROUGHBREDS.						
1851	Clean Title	6 years	T. O'Callaghan	Wangaratta	8.9.10	Life	R.G.
431/3	Cornalla	3 years	Hay & Thonemann	Agricultural Offices	24.9.10	30.6.11	W.R.
1861	Domino	Aged	J. F. King	Colac	15.9.10	Life	G.S.B.
1768	Fulminator	Aged	A. E. Bowman	Melbourne	25.7.10	,,	G.S.B.
456/3	Harmattan	3 years	R. W. Storey	Euroa	13.12.10	30.6.11	Appeal Board
189/4	Little Gun	4 years	J. C. H. Graves	Mansfield	23.9.10	,,	W.J.C.
140/4	Zalposki	4 years	J. W. Nolte	Casterton	6.9.10	,,	W.R.
	PONIES.						
108/2	Advance	2 years	L. Harper	Port Fairy Show	10.11.10	30.6.11	G.S.B.
43/4	Apabitos	4 years	W. E. Glendenning	Newmarket	1.8.10	,,	R.G.
369/3	Billie Barlow	3 years	Wm. Donaldson	Charlton	19.8.10	,,	G.S.B.
311/3	Bon Accord	3 years	J. N. Gordon	Melbourne	26.7.10	,,	G.S.B.
132/4	Bonnie Prince Charlie	4 years	S. MacKenzie	Royal Show	30.8.10	,,	W.R.
167/4	Brecknock	4 years	J. Darcy	Camperdown	14.9.10	,,	W.R.
80/4	Canary's Pride	4 years	G. W. Anderson	Minyip	11.8.10	,,	W.R.
1854	Chanter	Aged	H. McLean	Terang	13.9.10	Life	W.R.
310/3	Clifford	3 years	A. R. P. Crow	Melbourne	26.7.10	30.6.11	G.S.B.
1801	Clipper	Aged	R. S. Kirkpatrick	Watchem	10.8.10	Life	R.G.
1818	Colonel Osterley	5 years	A. J. Clark	Agricultural Offices	20.8.10	,,	G.S.B.
1800	Cronje	Aged	J. Powell	Warracknabeal	12.8.10	,,	W.R.
1860	Cutty Sark	Aged	U. Ramsay	Colac	15.9.10	,,	G.S.B.
1887	Cymro	Aged	Tintaldra Proprietary Coy.	Corryong	28.9.10	,,	R.G.
90/4	Dandy Bones	4 years	J. L. Loutit	Sea Lake	15.8.10	,,	W.J.C.
66/4	Dandy Brick	4 years	J. W. Baker	Donald	9.8.10	,,	R.G.
69/4	Dandy Chief	4 years	G. Crombie	Watchem	10.8.10	,,	R.G.
317/3	Dandy Huon	3 years	Thos. Moore	Melbourne	26.7.10	,,	G.S.B.
86/4	Dandy Jim	4 years	J. D. Pryse	Wycheproof	17.8.10	,,	W.J.C.
438/3	Dandy O'More	3 years	L. Tatterson	Dandenong	29.9.10	,,	W.R.
1778	Dandy Robin	Aged	E. E. Gomm	Melbourne	26.7.10	Life	W.R.
1736	Dick of Redmond	4 years	G. Tosch	Leongatha Show	16.2.10	,,	W.R.
134/4	Fiction	4 years	J. A. Marriage	Royal Show	30.8.10	30.6.11	R.G.
184/4	Fluter	4 years	W. H. Penaluna	Morwell	26.9.1	,,	G.S.B.
1755	Garfield Junior	Aged	W. McDonald	Horsham	14.7.10	Life	W.R.
168/4	Gay Laddie	4 years	Edward Cuthbert	Camperdown	14.9.10	30.6.11	W.R.
366/3	General Gordon	3 years	H. Dunn	Geelong	18.8.10	,,	R.G.
142/4	Gilbert	4 years	W. J. Brown	Hamilton	9.9.10	,,	W.R.

LIST OF CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date of Examination.	Date of Expiry of Certificate.	Officer.
			PONIES—*continued.*				
1889	Glyn Trustful	5 years	W. E. J. Craig	Agricultural Offices	1.10.10	Life	W.R.
135/4	Grandee	4 years	J. B. Irvine	Royal Show	30.8.10	30.6.11	W.R.
1888	Hafren Sensation	5 years	W. E. J. Craig	Agricultural Offices	1.10.10	Life	W.R.
1852	Happy Jack	Aged	T. Maroney	Wangaratta	8.9.10	,,	R.G.
1769	Harold Grey	Aged	R. J. Finnegan	Melbourne	25.7.10	,,	G.S.B.
1784	Here He Is	5 years	W. E. Rosling	Newmarket	1.8.10	,,	R.G.
1882	Herick	Aged	A. H. Poolman	Mansfield	23.9.10	,,	W.J.C.
404/3	Highland Chief	3 years	Hugh Martin	Yarrawonga	5.9.10	30.6.11	R.G.
1876	Honest Jack	Aged	C. H. Atkins	Bunyip	27.9.10	Life	W.R.
147/4	Interest	4 years	D. McLeod	Numurkah	6.9.10	30.6.11	G.S.B.
1884	Jem	5 years	Jas. Walsh	Frankston	24.9.10	Life	R.G.
118/4	Jock Frisk	4 years	Donald Stewart	Beaufort	22.8.10	30.6.11	R.G.
157/4	King Bally Junr.	4 years	W. Illingworth	Ballarat	10.9.10	,,	G.S.B.
367/3	King Edward VII.	3 years	C. Jones	Geelong	18.8.10	,,	R.G.
445/3	Lancewood	3 years	H. Gould Huon	Wodonga	26.9.10	,,	R.G.
1781	Little Ben	Aged	J. R. Fiske	Melbourne	26.7.10	Life	R.G.
174/4	Little Dandy	4 years	W. J. Trask	Colac	15.9.10	30.6.11	G.S.B.
320/3	*Little Hamble*	*3 years*	*F. C. Witchell*	*Melbourne*	*26.7.10*	,,	R.G.
198/4	Little Jack	4 years	P. W. Pollock	Korumburra	28.9.10	,,	W.R.
1845	Little King	Aged	G. Turnbull	Coleraine	6.9.10	Life	W.R.
120/4	Little Tonian	4 years	Tulloch and Coy.	Bendigo	24.8.10	30.6.11	R.G.
46/4	Look He Comes	4 years	W. E. Rosling	Newmarket	1.8.10	,,	G.S.B.
103/4	*Lou Lou's Dandy*	4 years	C. Jones and Sons	*Geelong*	18.8.10	,,	R.G.
1779	Lord Bally	5 years	J. W. Dent	Melbourne	26.7.10	Life	G.S.B.
1882	Lord Cardigan	6 years	H. Kenny	Korumburra	28.9.10	,,	W.R.
143/4	Marland Hero	4 years	Jas. Moodie & Sons	Tungamah	6.9.10	30.6.11	R.G.
1788	Marland Model	5 years	W. E. Rosling	Newmarket	2.8.10	Life	G.S.B.
1855	Master Brigham	Aged	J. Jackson	Camperdown	14.9.10	,,	W.R.
1799	Mooney	Aged	J. Robson	Jeparit	10.8.10	,,	W.R.
1903	Mountain Hero	Aged	S. J. Miller	Agricultural Offices	3.12.10	,,	E.A.K.
84/2	Mountain King	2 years	W. R. Pope	Donald	9.8.10	30.6.11	R.G.
1750	Paddock King Cole	Aged	W. E. Rosling	Agricultural Offices	9.7.10	Life	G.S.B.
1838	Prince	Aged	S. MacKenzie	Royal Show	30.8.10	,,	W.R.
32/4	Prince Dandy	4 years	F. Irish	Melbourne	26.7.10	30.6.11	W.J.C.
109/4	Prince Harold	4 years	Sam Pollock	Agricultural Offices	20.8.10	,,	R.G.
1777	Prince of Wales	6 years	A. V. Stocks	Melbourne	26.7.10	Life	W.R.
1803	*Quom Bone*	*Aged*	*James Duxon*	*St. Arnaud*	*16.8.10*	,,	G.S.B.
68/4	Radium	4 years	S. Lancaster	Goroke	10.8.10	30.6.11	G.S.B.
373/3	Reality Rex	3 years	S. O'Brien	Rochester	22.8.10	,,	G.S.B.
1839	Rex Dandy	5 years	Jno. Findlay	Royal Show	30.8.10	Life	W.R.
1737	Richard II.	Aged	J. Jaw	Leongatha Show	16.2.10	,,	W.R.
83/2	Robin Gray	2 years	W. S. Young	Ararat	9.8.10	30.6.11	G.S.B.
451/3	Royal Clem	3 years	A. J. Chisholm	Maldon Special	10.10.10	,,	W.J.C.
1900	Royal Jimmy	Aged	W. J. Clark	Kyneton Show	17.10.10	Life	W.R.
1840	Sam	Aged	J. P. J. Bell	Royal Show	30.8.10	,,	G.S.B.
362/3	Sandow	3 years	Ed. Glasheen	Boort	18.8.10	30.6.11	W.J.C.
67/4	Sarsfield	4 years	Thos. Long	Donald	9.8.10	,,	R.G.
1771	Silver King	5 years	J. A. Johnston	Melbourne	25.7.10	Life	G.S.B.
439/3	Silver King	3 years	B. A. Hall	Dandenong	29.9.10	30.6.11	W.R.
1898	Silver Prince	Aged	R. A. Gibson	Port Fairy Show	10.11.10	Life	G.S.B.
199/4	*Sirdan*	*4 years*	*R. Reid*	*Tallangatta*	*27.9.10*	*30.6.11*	R.G.
59/4	Squib	4 years	D. Robertson	Ararat	9.8.10	,,	G.S.B.
436/3	Starlight	3 years	J. M. Brown	Korumburra	28.9.10	,,	W.R.
1835	Sunset	5 years	P. Olds	Kerang	24.8.10	Life	W.R.
312/3	Tichbourne	3 years	A. E. Godden	Melbourne	26.7.10	30.6.11	G.S.B.
1849	*Toby*	5 years	*Ian Ralston*	Rutherglen	7.9.10	Life	R.G.
1738	Tongo	Aged	J. J. Leighton	Leongatha Show	16.2.10	,,	W.R.
1902	Toy Boy	5 years	Wm. Hopper	Agricultural Offices	26.11.10	,,	W.R.
87/2	Trillick	2 years	A. S. Goddard	Geelong	18.8.10	30.6.11	R.G.
1891	True Boy	Aged	William J. Brown	Penshurst	11.10.10	Life	R.G.
145/4	The Don	4 years	E. Ryan	Numurkah	6.9.10	30.6.11	G.S.B.
159/4	Victory	4 years	T. Reid	Ballarat	10.9.10	,,	G.S.B.
82/4	Welsh Flyer	4 years	Jno. F. Beasley	Birchip	11.8.10	,,	R.G.
112/4	Welshman	4 years	Canute Hogan	Rochester	22.8.10	,,	G.S.B.
1789	Welsh Style	6 years	Samuel Wadeson	Wangaratta	22.7.10	Life	W.R.
337/3	Welsh Tom	3 years	Colin Gardner	Wangaratta	22.7.10	30.6.11	W.R.
60/4	Wilkes Junr.	4 years	Jno. Tait	Ararat	9.8.10	,,	G.S.B.
1885	Wonder	6 years	A. Millard	Tallangatta	27.9.10	Life	R.G.
454/3	Wonderful	3 years	Wm. McNab	Alexander Show	10.11.10	30.6.11	W.J.C.
133/4	*Young Dandy Junior*	4 years	*A. C. Lyons*	*Royal Show*	*30.8.10*	,,	G.S.B.
1881	Young Jimmy	6 years	T. Adkins	Korumburra	28.9.10	Life	W.R.
1843	Young Midnight	6 years	T. Houlihan	Cobram	5.9.10	,,	G.S.B.
1819	Young Sunbeam	Aged	Hutcheson Bros.	Rochester	22.8.10	,,	G.S.B.

STALLION PARADES. 1911.*

Time Table.

District and Date.	Place.	Time.	Officer Arrives.	Officer Leaves.
SPECIAL.				
24th, 25th, 26th 27th, and 28th July	City Horse Bazaar	10 a.m. daily		
Monday, 24th July ..	Newmarket Horse Bazaar	10 a.m.		
Every Saturday from 1st July to 16th December	Agricultural Offices	10 a.m. to 12 noon		
Wednesday, 19th July	Sea Lake ..	2 p.m. ..	12.30 p.m., driving	6.40 a.m. (20th)
Friday, 21st July ..	Wangaratta	10 a.m. ..	9.5 p.m. (22nd)	4.30 p.m.
Wednesday, 2nd Aug.	Bendigo ..	2 p.m. ..	1.22 p.m. ..	6.50 p.m.
WIMMERA, No. 1.				
12th and 13th July ..	Horsham ..	10 a.m. ..	11.59 p.m. (11th)	2.59 a.m. (14th)
Wednesday, 2nd Aug.	Murtoa ..	2 p.m. ..	12.10 a.m. ..	3.32 a.m. (3rd)
Week ending 12th August.				
WIMMERA, No. 2.				
Tuesday, 8th Aug. ..	Ararat ..	2 p.m. ..	1.29 p.m. ..	9.37 p.m.
Wednesday, 9th Aug.	Goroke ..	2 p.m. ..	1.40 p.m. ..	6.30 a.m. (10th)
Thursday, 10th Aug.	Edenhope ..	3 p.m. ..	12 noon ..	2.30 p.m. (11th)
WIMMERA, No. 3.				
Monday, 7th Aug. ..	Stawell ..	3 p.m. ..	2.38 p.m. ..	10.13 p.m.
Tuesday, 8th Aug. ..	Rainbow ..	2 p.m. ..	1.15 p.m. ..	3.30 p.m.
Wednesday, 9th Aug.	Jeparit ..	2 p.m. ..	4.40 p.m. (8th)	5.17 p.m.
Thursday, 10th Aug.	Minyip ..	2 p.m. ..	6.12 a.m. ..	6.12 a.m. (11th)
Friday, 11th Aug. ..	Warracknabeal	1.30 p.m.	8 a.m. ..	2.55 p.m.
MALLEE, No. 1.				
Tuesday, 8th Aug. ..	Birchip ..	2 p.m. ..	8.30 p.m. (7th)	9 a.m. (9th)
Wednesday, 9th Aug.	Donald ..	2 p.m. ..	11.45 a.m. ..	6 p.m.
Thursday, 10th Aug.	Watchem ..	2 p.m. ..	7.27 p.m. (9th)	3.40 a.m. (11th)
Friday, 11th Aug. ..	St. Arnaud	11 a.m. ..	7.11 a.m. ..	2.10 p.m.

* At centres where the Examining Officer remains overnight after the Parade, arrangements may be made for a Lecture on some veterinary or stock subject if application is made to the Chief Veterinary Officer before 1st July.

TIME TABLE, STALLION PARADES—*continued.*

Week ending 19th August.

District and Date.	Place.	Time.	Officer Arrives.	Officer Leaves.
CENTRAL No. 1.				
Monday, 14th Aug. ..	Heathcote ..	2 p.m. ..	11.41 p.m. ..	8.17 p.m.
Tuesday, 15th Aug. ..	Dunolly ..	2 p.m. ..	1.46 p.m. ..	9.17 a.m. (16th)
Wednesday, 16th Aug.	Maryborough	2 p.m. ..	10 a.m. ..	6.5 a.m. (17th)
Thursday, 17th Aug.	Inglewood ..	2 p.m. ..	8.40 a.m. ..	4.25 p.m.
Friday, 18th Aug. ..	Benalla ..	2 p.m. ..	11.15 a.m. ..	5.35 p.m.
Saturday, 19th Aug.	Geelong ..	10 a.m. ..	8.10 a.m. ..	12.32 p.m.
MALLEE, No. 2.				
Tuesday, 15th Aug. ..	Quambatook	10 a.m. ..	6.15 p.m. (14th)	11.10 a.m.
Tuesday, 15th Aug. ..	Boort ..	2 p.m. ..	12.34 p.m. ..	6.10 a.m. (16th)
Thursday, 17th Aug.	Wycheproof	10 a.m. ..	5.5 p.m. (16th)	11.10 a.m.
Thursday, 17th Aug.	Charlton ..	2 p.m. ..	12.25 p.m.	12.2 p.m.
Saturday, 19th Aug.	Castlemaine	10 a.m. ..	7.20 a.m. ..	12.56 p.m.
WIMMERA, No. 4.				
Monday, 14th Aug. ..	Cobram ..	2 p.m. ..	1.57 p.m. ..	3.10 p.m.
Tuesday, 15th Aug. ..	Beaufort ..	2 p.m. ..	12.27 p.m. ..	8.35 p.m.
Wednesday, 16th Aug.	Nhill ..	2 p.m. ..	1.31 a.m. ..	1.38 a.m.
Thursday, 17th Aug.	Kaniva ..	2 p.m. ..	2.28 a.m. ..	12.42 a.m. (18th)
Friday, 18th Aug. ..	Dimboola ..	2 p.m. ..	2.13 a.m. ..	2.18 a.m. (19th)

Week ending 26th August.

District and Date.	Place.	Time.	Officer Arrives.	Officer Leaves.
MALLEE, No. 3.				
Tuesday, 22nd Aug.	Swan Hill ..	2 p.m. ..	6.6 p.m. (21st) ..	10.35 a.m. (23rd)
Wednesday, 23rd Aug.	Kerang ..	2 p.m. ..	12.14 p.m. ..	1.9 p.m.
Thursday, 24th Aug.	Pyramid ..	2.30 p.m.	2.26 p.m. ..	2.26 p.m. (25th)
Saturday, 26th Aug.	Ballan ..	10 a.m. ..	10.3 a.m. ..	12.7 p.m.
CENTRAL AND MALLEE.				
Monday, 21st Aug. ..	Daylesford ..	2 p.m. ..	11.50 a.m. ..	3.40 p.m.
Tuesday, 22nd Aug.	Beulah ..	2 p.m. ..	8.52 a.m. ..	9.15 a.m. (23rd)
Wednesday, 23rd Aug.	Hopetoun ..	10.15 a.m.	10.15 a.m. ..	11.30 a.m.
Thursday, 24th Aug.	Hamilton	2 p.m. ..	10 a.m. ..	6.28 p.m.
Friday, 25th Aug. ..	Clunes ..	10 a.m. ..	8.54 a.m. ..	1.43 p.m.
GOULBURN VALLEY, No. 1.				
Monday, 21st Aug. ..	Elmore ..	1.30 p.m.	1.11 p.m. ..	2 p.m., driving
Monday, 21st Aug. ..	Rochester ..	3.30 p.m.	3.30 p.m., driving	10.19 p.m.
Tuesday, 22nd Aug.	Echuca ..	11 a.m. ..	10.58 p.m. (21st)	2.55 p.m.
Tuesday, 22nd Aug...	Kyabram ..	4.40 p.m.	4.20 p.m. ..	10 a.m. (23rd)
Wednesday, 23rd Aug.	Tatura ..	2 p.m. ..	12 noon, driving	5.36 p.m.
Thursday, 24th Aug.	Murchison ..	11 a.m. ..	11 a.m. ..	12 noon, driving
Thursday, 24th Aug.	Rushworth	2 p.m. ..	1.30 p.m., driving	5.20 p.m.
Friday, 25th Aug. ..	Shepparton..	2 p.m. ..	8.23 p.m. (24th)	5.49 p.m.
ROYAL SHOW.				
Tuesday, 29th Aug. ..	Show Grounds, Flemington	8 a.m. to 10 a.m.		

Time Table, Stallion Parades—*continued.*

District and Date.	Place.	Time.	Officer Arrives.	Officer Leaves.
Week ending 9th September.				
GOULBURN VALLEY, No. 2.				
Monday, 4th Sept.	Bacchus Marsh	11 a.m.	8.55 a.m.	12.59 p.m.
Tuesday, 5th Sept.	Numurkah	2 p.m.	4.28 p.m. (4th)	12.50 p.m. (6th)
Wednesday, 6th Sept.	Nathalia	2 p.m.	1.40 p.m.	3.25 p.m.
Thursday, 7th Sept.	*Dookie*	*2 p.m.*	*12.52 p.m.*	*4.11 p.m.*
Friday, 8th Sept.	Seymour	10 a.m.	8.12 p.m. (7th)	11.13 a.m.
Saturday, 9th Sept.	Ballarat	2 p.m.	11.8 a.m.	7.10 p.m.
WESTERN, No. 1.				
Tuesday, 5th Sept.	Coleraine	11 a.m.	7.35 p.m. (4th)	2 p.m., driving
Wednesday, 6th Sept.	Casterton	2 p.m.	4.30 p.m. (5th), driving	8.15 a.m. (7th)
Thursday, 7th Sept.	Portland	2 p.m.	1.2 p.m.	3.10 p.m.
Friday, 8th Sept.	Penshurst	2 p.m.	7.33 p.m. (7th)	7.48 p.m.
NORTH-EASTERN, No. 1.				
Tuesday, 5th Sept.	Yarrawonga	10 a.m.	10.22 p.m. (4th)	2.45 p.m.
Tuesday, 5th Sept.	Tungamah	2 p.m.	3.38 p.m.	7.45 a.m. (6th)
Wednesday, 6th Sept.	Rutherglen	2 p.m.	1.48 p.m.	3.22 p.m.
Thursday, 7th Sept.	*Kilmore*	*2 p.m.*	*9.50 p.m. (6th)*	*4.41 p.m.*
Friday, 8th Sept.	Euroa	2 p.m.	6.57 p.m. (7th)	6.32 p.m.
Saturday, 9th Sept.	Melton	11 a.m.	8.35 a.m.	1.20 p.m.
Week ending 16th September.				
WESTERN, No. 2.				
Monday, 11th Sept.	Terang	2 p.m.	12.44 p.m.	10.7 p.m.
Tuesday, 12th Sept.	*Port Fairy*	*10 a.m.*	*12.36 p.m.*	*1.30 p.m.*
Wednesday, 13th Sept.	Camperdown	2 p.m.	5.5 p.m. (12th)	9.30 p.m.
Thursday, 14th Sept.	Warrnambool	2 p.m.	11.12 p.m. (13th)	7.11 a.m. (15th)
Friday, 15th Sept.	Colac	2 p.m.	10.4 a.m.	6.52 p.m.
Saturday, 16th Sept.	Werribee	10 a.m.	7.17 a.m.	1.25 p.m.
GIPPSLAND, No. 1.				
Monday, 11th Sept.	Morwell	2 p.m.	11.57 a.m.	12.20 p.m. (12th)
Tuesday, 12th Sept.	Mirboo	2 p.m.	2 p.m.	4.15 p.m.
Wednesday, *13th* Sept.	Traralgon	*11 a.m.*	9.45 p.m.	12.20 p.m.
Wednesday, 13th Sept.	Bairnsdale	3.30 p.m.	3.25 p.m.	9.30 a.m. (14th)
Thursday, 14th Sept.	Maffra	2 p.m.	12.33 p.m.	4.17 p.m.
Friday, 15th Sept.	Lilydale	2 p.m.	9.33 p.m.	5.35 p.m.
CENTRAL, No. 2.				
Monday, 11th Sept.	Romsey	2 p.m.	10.10 a.m.	5.25 p.m.
Tuesday, 12th Sept.	Kyneton	2 p.m.	8.21 p.m. (18th)	5.25 p.m.
Wednesday, 13th Sept.	Smeaton	2 p.m.	9 a.m., driving	4 p.m., driving
Thursday, 14th Sept.	Alexandra	2 p.m.	12.35 p.m.	4.40 p.m.
Friday, 15th Sept.	Mansfield	2 p.m.	1.53 p.m.	3.35 p.m.

Time Table, Stallion Parades—*continued.*

Week ending 23rd September.

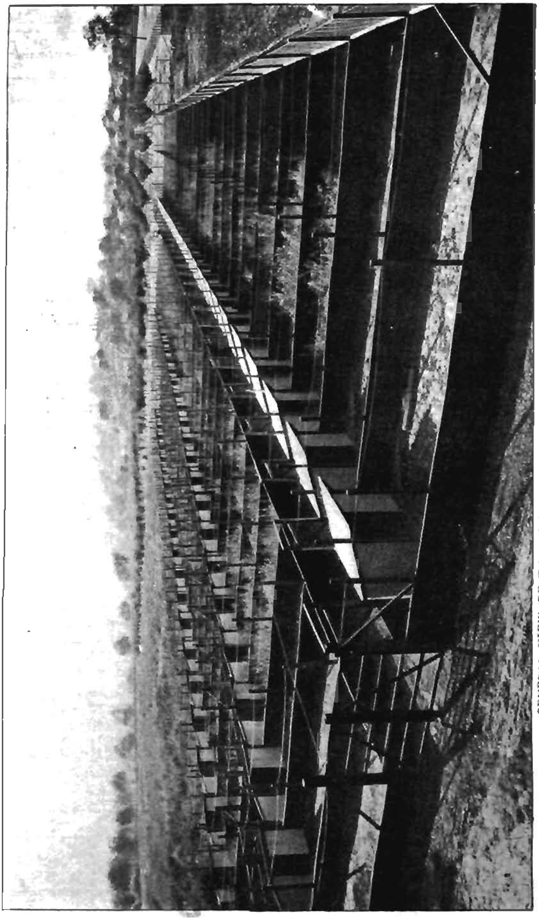
District and Date.	Place.	Time.	Officer Arrives.	Officer Leaves.
GIPPSLAND, No. 2.				
Monday, 18th Sept. ..	Trafalgar ..	2 p.m. ..	11.16 a.m. ..	6.51 p.m.
Tuesday, 19th Sept...	Bunyip ..	10 a.m. ..	8.19 p.m. ..	2.10 p.m.
Tuesday, 19th Sept...	Warragul ..	3 p.m. ..	2.56 p.m. ..	7.50 p.m.
Wednesday, 20th Sept.	Korumburra	2 p.m. ..	9.55 a.m. ..	5.10 p.m.
Thursday, 21st Sept...	Cranbourne..	10 a.m. ..	10 a.m., driving	11.30 a.m., driving
Thursday, 21st Sept...	Dandenong..	2 p.m. ..	12.30 p.m. ..	4.48 p.m.
Friday, 22nd Sept. ..	*Whittlesea* ..	*2 p.m.* ..	*12.45 p.m.* ..	*8 p.m.*
NORTH-EASTERN, No. 2.				
Monday, 18th Sept. ..	Wodonga ..	2 p.m. ..	1.39 p.m. ..	3.13 p.m.
Tuesday, 19th Sept...	Tallangatta..	2 p.m. ..	4.35 p.m. (18th)	5 a.m. (20th)
Wednesday, 20th Sept.	Corryong ..	3.30 p.m.	3.30 p.m. ..	7 a.m. (21st)
GIPPSLAND, No. 3.				
Monday, 18th Sept. ..	Yarram ..	4 p.m. ..	3.45 p.m. ..	10.55 a.m. (19th)
Tuesday, 19th Sept...	Foster ..	3 p.m. ..	2.1 p.m. ..	2.21 p.m. (20th)
Wednesday, 20th Sept.	Leongatha ..	4 p.m. ..	3.56 p.m. ..	7.25 a.m. (21st)
Friday, 22nd Sept. ..	Lang Lang	2 p.m. ..	9.25 a.m. ..	6.37 p.m.
Saturday, 23rd Sept.	Frankston ..	11 a.m. ..	9.34 a.m. ..	1.1 p.m.
Tuesday, 3rd Oct. ..	Orbost ..	3 p.m. ..	2 p.m. ..	8.2 a.m. (4th)

BURNLEY EGG-LAYING COMPETITION, 1911-12.

H. V. Hawkins, Poultry Expert.

No other State in the Commonwealth has done more to raise the standard of its farm poultry than Victoria. This has been accomplished by means of lectures, demonstrations at shows, visits to farmers, and distribution of literature. During the past nine years, short courses of instruction, extending over several days, have been held in almost every district. These have been well attended, with the result that there has been a large increase in egg production. At one time, farmers were content to keep a few nondescript fowls—the question of breed, strain, or even of age, was given but little thought. Now, there are many men and women farming poultry as a distinct business. By their industry and enthusiasm they have worked up successful farms. Most of these have wisely kept to one particular breed and by culling out the unprofitable birds are breeding only from the best. So great an interest has been taken in the output of eggs that a computation, made by the Superintendent of Exports (Mr. R. Crowe), and the writer, as to the relative values of Australian eggs, shows that Victoria leads the way at 24s. 6d. per head of population, South Australia being 20s. 6d., and New South Wales 14s.

As a further incentive to farmers, especially small holders, to increase the egg yield, the Hon. the Minister for Agriculture (Hon G. Graham, M.L.A.) decided last July to inaugurate an Annual Egg-laying Competition



GENERAL VIEW OF THE POULTRY PENS, BURNLEY HORTICULTURAL GARDENS.

at the Burnley Horticultural Gardens. Burnley is so conveniently situated that farmers visiting the metropolis will be able to make an inspection without loss of time. By some, the location was thought to be unsuitable, but the Hon. the Minister, who was desirous of maintaining Burnley as an educational centre for training students in fruit-growing and poultry raising, gave authority for the erection of 70 pens of 30 feet by 12 feet each.

The clearing, draining, and building have been carried out under the supervision of the Public Works Department from designs supplied by the writer. A good idea of the extent of the buildings will be obtained from the accompanying photographs, which were taken on the 10th March. The greatest difficulty overcome during the progress of the work was that of providing adequate drainage. During that time, less than seven weeks, 10 inches of rain fell. Although it retarded the workmen, no better test could have been arranged. The result will be a valuable object lesson to new settlers and others who intend farming poultry on their holdings.

SHELTER.

The Victorian Competition will be the first at which sheltered pens have been introduced. The pens are divided by 3 feet of plain sheet iron, surmounted by 4 feet of 2½ mesh wire-netting, without a top rail. An ideal break-wind is thus provided. It also prevents the birds from quarrelling, as is usually the case when the division consists of wire netting alone. The iron is tarred and insect-proof.

The houses are made of 14 sheets of narrow gauge galvanised iron—4 sheets on roof, 4 at back, 2 at each end, with 2 covering half the front. The frame work, which is on the outside, consists of 3 inch x 1½ inch jarrah; the only timber seen inside each house is two pieces of jarrah, 15 inches high, and a 14 feet long perch of 3 inch x 2 inch jarrah. The latter is dropped into a slot, so that it may be removed at will, and cleaned when necessary. This perch, in the writer's opinion, is practically proof against vermin. The floors of the houses are covered with sand to the depth of 6 inches, which is kept in position by a piece of jarrah. The sand will make the birds snug during the winter months and also be a safeguard against dirty and broken eggs.

DUST BOX, WATER, ETC.

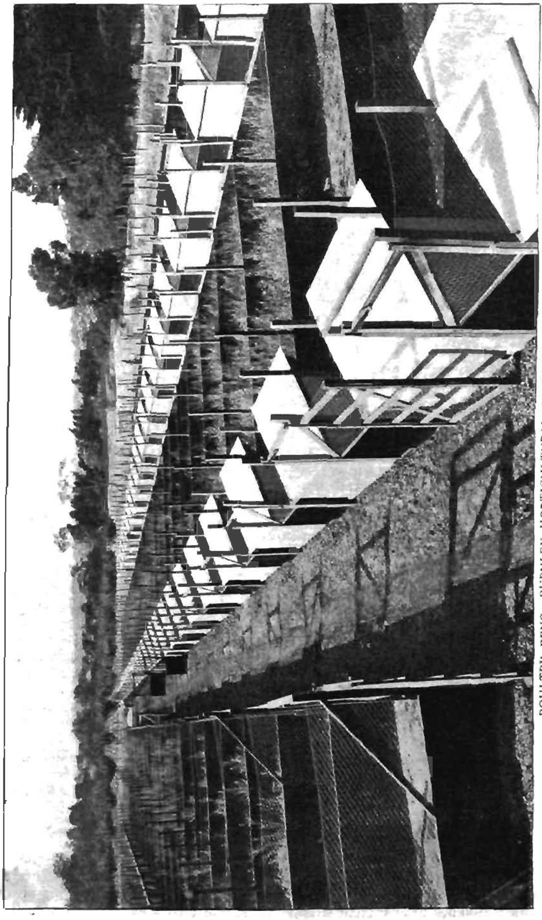
Outside each house a triangular dust box of pure sand is provided. A water main has been laid down each corridor, with four taps for each 300 feet. The hose for filling the water tins will also be available for damping the dust bath during the summer months. Vessels for charcoal, shell, and earthenware grit are suspended above ground within easy reach of the birds. Oaten hay is placed in each pen and feed is scattered amongst the hay, thereby inducing healthy exercise.

It is intended to plant Buddlea shrubs, which grow rapidly and are evergreen, in the centre of each pen. Without some natural shade the heat thrown off from the iron buildings would be harmful.

Although couch grass was sown three months ago, and germinated well, much of it was destroyed during the building operations. It is not intended to rely upon the grass in the pens—at least 2 ozs. of green feed are given them daily. The question of feeding will be dealt with in a subsequent issue.

BROODY HENS.

A portable screen, made of wire netting on a light frame, will be placed in a sheltered corner of any pen where a broody hen may be. This is to avoid removing birds to a distant pen. It will obviate the knocking about which broodies receive from strange birds, and also when they are returned



POULTRY PENS, BURNLEY HORTICULTURAL GARDENS. SHOWING CORRIDOR.

to their usual quarters—treatment which militates against the competitor's chance of success.

ENTRIES AND PRIZE LIST.

There are 402 birds entered for the competition. As will be seen by the following list, the leading breeds are represented, although it would have been desirable to have had more entries of some of them.

Breed.	*Pens.*	*Birds.*
White Leghorn	49	294
Brown Leghorn	2	12
Black Orpington	5	30
White Orpington	1	6
Silver Wyandotte	4	24
Golden Wyandotte	2	12
Minorca	2	12
Faverolle	1	6
Surrey	1	6
	67	402

The White Leghorns are, as usual, well represented, and should be to the fore at the conclusion of the competition, but the winter test will probably find the Orpingtons and Wyandottes leading. For the prize for the greatest weight of eggs laid throughout the year the Minorcas should have a chance.

The prize list is as follows:—

Greatest Number of Eggs during the Twelve Months (1st April, 1911, to 31st March, 1912).

1st prize, £10; 2nd prize, £5 5s.; 3rd prize, £3 3s.

Winter Test (First Four Months—April to July).

1st prize, £4 4s.; 2nd prize, £2 2s.

Greatest Weight of Eggs during the Competition.

1st prize, £3 3s.

COMPETITION RULES.

The rules governing the competition were published in the *Journal* for November, 1910. The Arbitration Committee, which will decide any dispute arising during the competition, is composed of the following members:—

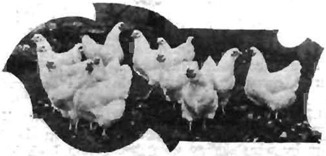
Elected by Competitors. — Messrs. J. Anderson, G. E. Brown, H. McKenzie, and W. G. Swift.

Ex-officio.—Dr. S. S. Cameron (Director of Agriculture), Messrs. E. E. Pescott (Principal, School of Horticulture), and H. V. Hawkins (Organizer).

RECORDS, VISITING DAYS, ETC.

Weekly records are placed on each pen for the information of visitors.

The visiting days are Wednesdays and Saturday from 2 p.m. to 4 p.m. Intending visitors must previously procure admission cards from the Department of Agriculture.



ORCHARD AND GARDEN NOTES.

E. E. Pescott, Principal, School of Horticulture, Burnley.

The Orchard.

Gathering and Storing Apples and Pears.

The principal work this month will be the gathering and storing of apples and pears. Stored fruit needs more attention and care than that gathered for immediate sale. The fruits should be carefully handled, and not thrown about in any way, nor should it be bruised. No cracked or injured fruit should be allowed in the storage room. Owing to the excessively wet season, a greater percentage than usual of cracked and split fruit is present, and this will very speedily rot. It should be disposed of at once.

Such varieties as Rokewood, Schroeder's Apfel, Shockley, Yates, Rome Beauty, Stone Pippin, and Mellon's Seedling are all good keepers, and useful for storage purposes. The latter apple is winning its way among orchardists, and it is a desirable apple for the late local markets. In its natural home, at Dunolly, where it was raised some years ago, it keeps very late; and, in many instances, is quite sound early in November. In other districts, and grown on richer soils, it does not seem to retain its keeping characteristics. Another point in its favour is that at present it has shown no signs of Bitter Pit.

Spraying.

Owing to the excessive rains developing and encouraging the Plum Rust, many stone fruit trees, particularly plums, have lost a very large percentage of their foliage. Such trees may now be sprayed with an oil emulsion wherever Scale or Bryobia Mite is at all prevalent. Apple and pear trees whose crops have been gathered may also be sprayed with the emulsion, wherever Scale, Bryobia Mite, Woolly Aphis, or Pear Phytoptus has previously shown itself.

Green Manuring.

If not already done, and the orchard conditions demand it, there is still time to put in a leguminous crop for green manuring purposes. But this should be done as early as possible, so as to give the crop a chance to make some good early growth.

Soils deficient in humus, or in organic matter, are always benefited by a crop of green manures. Where stable manure is unprocurable, the green manure crop is the only means of adding any organic matter to the soil.

Drainage.

The present season has shown the great necessity for drainage. It is true that the rainfall has been phenomenal, and unprecedented; but it is just as likely to occur in future years, and undrained areas will suffer considerably from such unusual soakings, especially at a time of the year when rain is not usually experienced. It has been laid down definitely that the greatest success in orchard work is not attainable unless the land has a thorough system of under-drainage. This is proved by experience; and now is the time to carry out this work. If done now, the drains will be in a position to carry away any surplus rain that may come in the ensuing winter.

Drains should be set well into the clay, and below all possible cultivation depth. The opening or first inlet to the drain should be well protected, preferably by wire netting or a flower pot, both if they are avail-

able. The outlet should always be left so that it can be readily seen—a substantial stake might be placed so as to mark the outlet. Another important point to be considered is the keeping of records and plans of all drains laid down. If possible, all new areas should be drained before planting.

PREPARATION OF NEW LAND.

As mentioned last month, all land for new planting should be prepared and ploughed early so as to allow the soil to mellow and sweeten for some time before planting. This should be done at once.

Vegetable Garden.

There should now be no untidy or undug plots in the kitchen garden. The vacant beds should all be well dug over and prepared for the planting of vegetables for use in spring. In digging, a top dressing of manure should be given; this may be dug in. All weeds, too, may be forked into the trenches, and covered well with the soil as each spit or length is dug. A dressing of lime is very beneficial at this time of the year.

ASPARAGUS BEDS.

A start should now be made at cleaning out the asparagus beds. This vegetable is most popular, and yet one rarely met with in ordinary household gardens. It is supposed to be difficult to grow, but this supposition is not borne out; as, once established, a bed of asparagus is one of the most easily managed plots in the whole garden. Depth of good soil and plenty of manure are all that this plant requires.

In establishing a new bed, it is advisable to see that there is a good depth of two or three feet of rich, well manured soil. If this is not present, the soil should be dug out to that depth, and thoroughly mixed and enriched with well rotted manure before being replaced. A bed deeply prepared, and supplied with ample quantities of manure, should last without replanting for very many years. The young plants or crowns should then be planted in trenches, keeping the rows two or three feet apart. An asparagus bed requires ample and direct exposure to the full rays of the sun. The asparagus should not be cut during the first season after planting. In fact, it is better to allow it to go uncut for two seasons. As little foreign weed growth as possible should be allowed in the beds; but, when they are not producing culinary asparagus, rows of lettuce, beans, radish, &c., may be grown between the crowns.

Towards the end of April the tops may be cut down, the beds cleaned, and a good top dressing of stable manure given. Chemical fertilizers, such as bonedust, sulphate of ammonia, and sulphate of potash, may be given as a substitute to organic manure. In the past it has been the custom to annually top dress the beds with salt. It was supposed that, as asparagus in its native habit was usually found in sandy soils near the sea coast, the plant required salt or a saline soil, to produce successful results. It has latterly been found that salt is not at all essential to good growth, and that the plant will readily adapt itself, and grow well, in soils of not at all a saline character. Where potash has taken the place of salt, quite improved results followed.

It is a good rule to observe that no ripe seeds shall be allowed to fall on to the beds; they should be stripped off the plants before they have a chance to drop. Seedlings will become a nuisance in the beds, and they interfere with the regularity of the rows.

SOWING.

A few early peas, also some broad beans, may now be sown; cabbage, cauliflower, and other seedlings should be planted out from the seed beds.

All garden salads, such as thyme, mint, horse-radish, sage, &c., as well as rhubarb, should be divided and planted out where necessary.

Onion seeds for an early crop may be planted out towards the end of the month. Brown Spanish is very hard to beat, as an all round onion; while the new variety of Early Brown Spanish may be relied upon to produce an early crop.

Flower Garden.

The excessive rainy season has been disastrous to many gardens. Quite an unusual number of plants have been killed as a result of the frequent rains. In one garden every plant of that valuable winter flowering shrub, *Othonnia Athanasiæ*, was destroyed; dahlias and carnations are also among the sufferers. This shows the necessity for trenching and drainage; and these very necessary works require present consideration.

The garden will soon need digging over, and before this is done, a good surface dressing of stable manure should be given; this may afterwards be dug in.

Shrubs, divisions of herbaceous plants, hardy annuals, and cuttings of hardy plants may now all be planted out. Carnation cuttings planted during this month should thrive readily. Pansies should be planted out. Plants still flowering, such as autumn roses and chrysanthemums, will now need attention. No liquid manure should be given when the plants are flowering; the weak buds and side shoots should be kept pinched out so as to insure good blooms. All bulbs, corms, and tubers should now be planted; a large proportion of these will now be above ground. These should be protected from slugs and snails by a liberal use of insecticides.

A PROLIFIC PLUM.

P. J. Carmody, Chief Inspector of Orchards.

For the past two years, plums have realized such abnormally low prices that those who have embarked to any great extent in plum culture find themselves in a somewhat serious position, as it is unlikely that in the immediate future any relief by way of advance in prices can be looked for.

In the season 1907-8, the area of plums in bearing was roughly 2,320 acres, whereas 1,870 acres represented the area that had been planted out but had not, up till then, produced fruit, and a considerable acreage of the plum variety has been put in since that time. It is, therefore, obvious that if, previous to 1907, the supply was at all in the neighbourhood of the demand, it must by this have more than overtaken it, and only those who have intelligently selected varieties suitable to their location and inherently inclined to yield heavy and regular crops can hope to be commercially successful in this particular industry. The factories, if they make any differentiation at all in the prices they pay for plums, do so in favour of the light coloured varieties, so that no inducement is offered to growers to plant out such plums as are noted for their excellence in texture and flavour, if they are not also commendable for their abundance in production.

From the Asiatic species of plums may be selected varieties with the best reputation as regards the quantity and regularity of cropping, even if somewhat inferior in quality to that of the European varieties. The Burbank plum introduced into America by Luther Burbank is one of those which conform to this reputation, when planted out in soils suitable to its tastes. Whatever may be the preference of this variety to particular soils, it is completely satisfied in the rich alluvial washes and river siltations that

FOUR-YEAR-OLD BURBANK PLUM WORKED ON CORDON SYSTEM. WEIGHT OF CROP, 146 LBS.

occur in many parts of the State along our creeks and rivers, as well as on the fertile highlands of Gippsland. It must be distinctly understood that this plum does not thrive in, but, in fact, rebels against our poorer classes of soils, unless plentifully supplied with stable manure or green manuring, as well as the addition of artificial manures necessary to the proper development of the fruit. The best guide to growers in the selection of land suitable for the Burbank is the growth and habit of the peach; for, wherever the peach flourishes, there this particular variety revels. From my experience, I find, as is the case with the apricot, an intimate relation to exist between the soils and the stocks upon which this plum is worked.

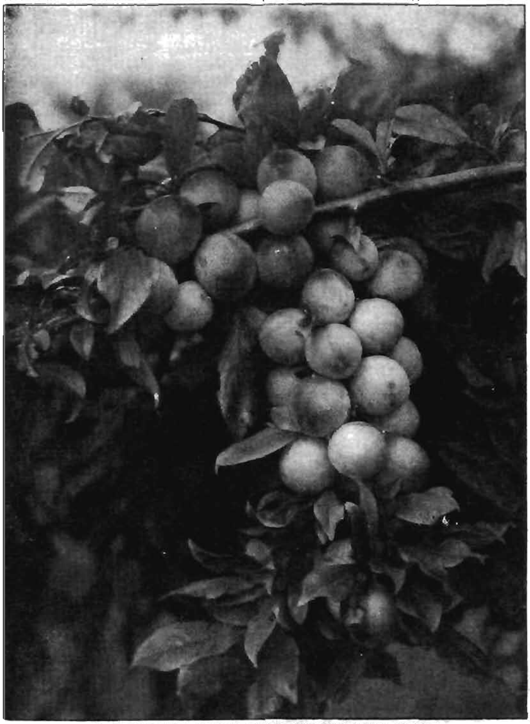
Not only does the Burbank render satisfactory service to extensive husbandry, but no other appears to fill the bill so completely for the cottager. The flesh of the fruit is of an amber colour, juicy and somewhat

2. SIX-YEAR-OLD GRAFT ON EARLY CRAWFORD (PEACH) STOCK. WEIGHT OF CROP, 193 LBS.

sweet with a medium sized stone, and makes jam of good quality and colour. As a dessert plum also it is considerably above the average, and trained on the cordon system is of excellent behaviour, occupies but little space, and produces immense crops. Even the horticulturist of considerable areas could, by cultivating this plum on the cordon system along the "highways" of his orchard, economize space and add to the trimness and neatness of his orchard.

Mr. Thomas Sebire, of Wandin, has satisfactorily adopted this system to a limited extent, and illustration No. 1 represents one of the trees four years old, with its immense crop (146 lbs.) for a tree of that age. The plums are planted 22 feet apart in the rows, which are 12 feet distant from each other. The trees in the one row should be planted directly opposite the mid-position between the two trees in the next row, so as to afford the

greatest area for root pasturage. The arms of the trees are trained along each of the wires of a six-wired fence 10 inches apart, so that one can understand the facility with which the fruit is handled and the trees controlled. The carrying capacity of a tree of this kind is enormous, as each of the twelve arms of the tree has room for an extension of 11 feet on either side, and, in addition, the projection of short light laterals from



3. FRUITING LATERAL FROM SIX-YEAR-OLD GRAFT.

each of these gives one some idea of the area of its fruit-bearing surface. Trees planted out such as here described must have sufficient supply of moisture to develop their respective crops, as the horizontal position of the leaders thus artificially secured increases the tendency to bear, with the result that dense masses of fruit appear all along the separate arms and the pendent laterals.

The universal adoption of the Myrobalan, or Cherry Plum (*Prunus myrobalana*) has not been singularly successful with this variety on all soils. Working trees on strong peach stocks, or on the common cherry plum (though on the latter a bad union is frequently formed), sometimes gives more satisfactory results; but, generally speaking, the first named is by far the best stock.

4. FRUITING LATERAL FROM SIX-YEAR-OLD GRAFT.

The Burbanks are six years from the graft, and last year yielded an average crop of eight cases per tree. The fruit realized in the Melbourne market 4s. per case, and £5 10s. per ton at the factory; whereas, during the present critical season, the plums from this orchard returned 3s. 2d. per case, a highly satisfactory return when we consider that many growers find their plums unsaleable. The Burbank is an excellent shipper to northern States, and, with judicious handling and selection, can be landed in perfect condition.

The infliction of a heavy crop of fruit on the single leader that survived the grafting operation caused it to break down with its burden, leaving but a narrow connexion between it and its root-system, yet 193 lbs. of splendidly developed fruit were obtained from this one branch.

The propensity of Burbank to heavy bearing intimates that the tree requires the best possible treatment, if this propensity is to be fostered and sustained. Proper cultivation, constant tillage throughout the summer, liberal application of manures to trees so generously responsive, and a correct interpretation of the habits of the tree to direct pruning operations, require the earnest attention of the grower.

As the tree has a very sprawling habit of growth the pruner will require to direct and develop leaders for the frame on such lines as will be conducive to vigorous and sturdy growth. From the illustrations on pages 293 and 294, it can be seen that lateral development is responsible for heavy crops; the proper spacing and retention of these laterals will govern and control its fruiting habit.

ANSWERS TO CORRESPONDENTS.

The Staff of the Department has been organized to a large extent for the purpose of giving information to farmers. Questions in every branch of agriculture are gladly answered. Write a short letter, giving as full particulars as possible, of your local conditions, and state precisely what it is that you want to know. *All inquiries forwarded to the Editor must be accompanied by the name and address of the writer.* This is very necessary, as sometimes insufficient information is furnished by the inquirer.

CABBAGE APHIS.—W.J.N. states that his cabbages are covered with blight, which is also attacking the swede turnips.

Answer.—Spray the turnips with a nicotine solution, and also the cabbages if they are fairly young. When the crop is taken out the soil should receive a good dressing of lime, and young plants should be dipped in a weak nicotine solution before planting.

CULTIVATION OF NUTS.—P.J.P. inquires as to cultivation of almonds, chestnuts, filberts, walnuts, &c.

Answer.—Before planting any large area inquiries should be made from wholesale grocers and dealers as to the market requirements, particularly for chestnuts. (See article on the Chestnut in the *Journal* for October, 1910.) Filberts require the richest soil of the four varieties mentioned. Plant the walnuts 40 feet apart with the almonds between them; that is, 20 feet from walnut to almond. When the walnuts are full grown the almonds may be taken out. Plant more than one variety of each nut, for cross-fertilization purposes.

CITRUS SCALE.—G.W. forwards scale-affected leaf of orange and asks for treatment recommended.

Answer.—The tree is evidently suffering from *Lecanium oleae*, and should be sprayed with red oil emulsion—1 in 30—in cloudy weather, or fumigated at the end of the present month.

IDENTIFICATION OF PLANTS.—G.J.F., W.F., W.T.L., and W.M. forward specimens of plants for identification.

Answer.—1. (G.J.F.) *Oryzopsis miliacea*, Benth. and Hook. f., Rice-millet Grass. A native of warm temperate regions of the old world, and a perennial pasture grass which stands drought well, also heat. It will stand moderate but not severe cold, and is a fairly good grass for dry regions or soils, but becomes tall on good ground, and is then useful for hay. It is not good for rotation farming, and is often a pest in gardens.

2. (W.F.) (*a*) *Trifolium tomentosum*, L., Woolly-headed Clover. (*b*) *Trifolium procumbens*, L., Yellow or Annual Hop Clover. (*c*) *Trifolium minus*, Rel., Slender Clover. (*d*) *Trifolium glomeratum*, L., Clustered Clover. (*a*), (*b*), and (*c*) are all clovers of somewhat similar character, having a slight pasture value, but not being in the first rank as pasture plants. The poorest is (*a*), next (*c*), and (*b*) and (*d*) come next, and are of approximately equal value.

3. (W.T.L.) *Trifolium procumbens*, L., Yellow or Annual Hop Clover. Of some value, especially on poor, dry pastures, but one of the less useful of the clovers. It is not obnoxious in any way, however, and easily maintains itself by seed.

4. (W.M.) *Agrostis stolonifera*, L., Creeping Bent. A naturalized alien. It is a fair pasture grass, particularly on soils which are wet in winter, and dry in summer.

LIQUID MANURE.—G.S.V. asks whether superphosphate with water would make a good liquid manure for vegetables.

Answer.—Superphosphate with water would not make a good liquid manure, as it only contains one ingredient of plant food—phosphoric acid. A good mixture for liquid manuring may be made by dissolving half-an-ounce of nitrate of potash and half-an-ounce of concentrated superphosphate in one gallon of water. It should be applied every month during the growth of the plant, and, if possible, when the soil is wet. A strong solution may be made and diluted as required to the above-mentioned strength, but it is not advisable to use a more concentrated solution. Several good fertilizers may be obtained from seedsmen.

RYE.—A.B. asks when is the best time to cut rye for hay for horses.

Answer.—Rye is only used as a green fodder and would not be suitable for hay purposes, on account of its low feeding value and the indigestible fibre in the stalks.

RAPE.—W.S.B. asks:—(1) Can rape be fed to milking cows without tainting the butter? (2) Is it a fact that young rape will not taint butter when older rape will?

Answer.—(1) By feeding rape in the morning only, and properly cooling and aerating the milk, tainting seldom, if ever, occurs. (2) Yes. When rape is in flower is the worst time for tainting.

SORGHUM.—G.R. asks in what stage in its growth is sorghum poisonous to cattle.

Answer.—Sorghum is liable to give dangerous results from Hoven or Tympanitis until after the flowering stage is past, in this respect resembling maize, clovers, &c. If growth is stunted or checked by frost, &c., prussic acid develops in excess and poisonous results rapidly follow. All danger may be overcome by allowing the sorghum to wilt for 24 hours before feeding to stock.

PEA-THRESHING MACHINE.—B.O'R inquires whether there is a pea-threshing machine on the market.

Answer.—No. Although many of the ordinary threshers are advertised as suitable for the purpose of threshing peas, they are generally found to crack a large amount of the grain.

FODDER CROPS, KOO-WEE-RUP.—R.G. writes:—"The land I am going on at Koo-wee-rup Swamp has been drained and under grass for about ten years. It appears to be sweet and in good condition. What would be the most suitable rotation of crops to grow for fodder?"

Answer.—Sow the following mixture:—1 bushel, stout white or Bonanza oats; 1 bushel, barley; ½ bushel, vetches; ¼ bushel, field peas; and ¼ bushel, rye, per acre. This could be followed with maize, and then root crops, such as mangolds, sugar beet, swedes, &c. The best manure for the oats, &c., would be ½ cwt. superphosphate, ½ cwt. bonedust, and 28 lbs. sulphate of potash per acre; for the root crops use ½ cwt. superphosphate and ½ cwt. sulphate of potash, and top dress with 14 lbs. nitrate of soda after thinning.

ROBBING HIVES.—Brighton writes:—"I have put my swarms in patent 8-frame hives with supers, with 24 1-lb. boxes in top. When will I be able to take the honey? What should I leave for winter use? In what frames are the brood nests?"

Answer.—The honey in the 1 lb. sections should be taken whenever they are well filled with comb and the honey capped over. The length of time it will take the bees to finish them depends entirely upon the strength of the colony and the nature of the honey flow. Under the most favourable conditions a colony will finish a rack in 10 to 14 days, but it usually takes much longer, depending greatly upon the honey-producing flora of the locality. The lower box containing the eight frames is called the brood-chamber and this should be full of honey at the beginning of winter, otherwise the bees cannot be expected to be in a thriving condition in spring and may actually die of starvation, as the consumption of honey from July to September is very heavy. If all the frames are very well filled and sealed in autumn one or two of the outside combs might be taken. Most bee-keepers, however, prefer to leave the brood chamber intact. If honey other than 1-lb. sections is required an upper storey with frames should be used in place of the section rack.

BEST HAY VARIETIES OF WHEAT.—G.J.F inquires as to best varieties of wheat to grow for hay.

Answer.—Bunyip, Firbank, Jade, Le Huguenot, Marshall's No. 3, and Warden's.

MANURING WHEAT, ULTIMA DISTRICT.—H.T. asks how much manure should be used when sowing wheat. The country is mostly sandy red loam and timbered with "Big Mallee" with a mixture of Hop Bush, Buloke, Pines, and Box. The rainfall is to 11-12 inches.

Answer.—Manure with superphosphate at the rate of 40 lbs. per acre.

COLIC.—J.K.K. writes:—"Please recommend a drench for Flatulent and Spasmodic Colic; also state how they may be distinguished. What injection is used for Spasmodic Colic?"

Answer.—Briefly, it may be stated that the prominent symptoms of Spasmodic Colic are sudden and acute pain with distinct intervals of rest; whereas, in Flatulent Colic, the pain is not sudden or (in the first stages) acute, and there are no intervals of rest. There is suppressed breathing, a tympanitic condition of the flank, and switching of the tail, which is usually carried erect. The violence of movement noticeable in Spasmodic Colic is not present in Flatulent cases, although there is an immense amount of discomfort and the animal is continuously moving, and turning the head around towards the flank. For Spasmodic Colic use the following drench:—Raw Linseed Oil, 1 pint; Tincture of Opium, 1 ounce; Spirits of Nitrous Ether, 1 ounce. An injection, per rectum, of 1 to 2 gallons of luke-warm water is advisable. For Flatulent Colic an ounce of Bi-carbonate of Soda in one and a half pints of water is a remedy always at hand; or one may use a drench composed of Aromatic Spirit of Ammonia, 1 ounce; Oil of Turpentine, 1 ounce; Tincture of Ginger, 1 ounce; in a pint of raw linseed oil.

BRUSHING.—P.J.D. has a horse which brushes badly in both front feet.

Answer.—Lowering the walls of the hoof on the inside, and using boots, is the best treatment.

BUTTER FAT.—W.S.B. writes:—"How much butter fat, without considering a balanced ration, can a cow make from (*a*) 1 ton of good oaten chaff, (*b*) 400 lbs. of oats?"

Answer.—The amount of butter fat a cow will make is independent of the fat contained in the food, and cannot be estimated in the manner suggested. The amount depends upon the inherent characteristics of the cow, and the amount of milk secreted. The quantity but not the quality of milk can of course be influenced by the feed, and so, indirectly, the amount of butter fat obtained will increase.

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THE CITY MILK SUPPLY.

J. S. McFadzean, Dairy Supervisor, Metropolitan Area.

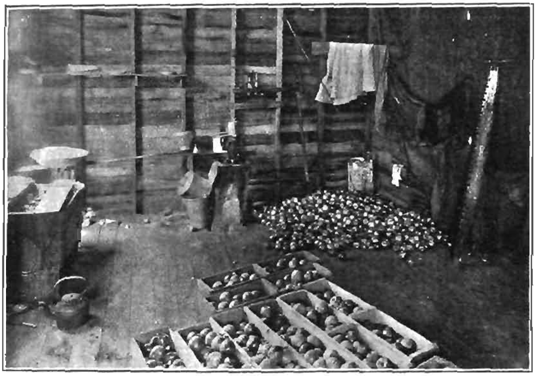
Fresh milk is one of the foods in universal use for which we have no substitute. It is nourishment alike for the infant and aged, the invalid, and the robust. Unfortunately, it has the disadvantage of being a perishable product, which deteriorates rapidly; and, unless proper care is taken in its handling, it may in a few hours become anything but a palatable food. It has also the disadvantage of being very easily adulterated, and thereby reduced in quality to a serious degree without possibility of detection by other than analytical examination.

Legislative Powers.

Recognising the necessity for keeping this nutritious and necessary food up to a proper standard of purity, the Victorian Legislature passed laws to control both its production and distribution. Every farm that produces milk for city supply, including the cattle, fodder, water, and utensils that are used in connexion with the dairy work, is under strict supervision. The milking cows are subjected to systematic manual examination by officers trained to the work; and, should any not be in satisfactory health, they are prohibited from use temporarily or permanently, according to how they are affected. The carriage and subsequent distribution of the milk is also under supervision by this same staff. The distribution is under the surveillance of another staff, whose special province it is to sample the milk as a check against its being adulterated. Samples are taken on the farms, on railway stations, and from dairies or milk waggons, at any hour of the day or night; and any one found selling an inferior, adulterated, or otherwise unwholesome product, is prosecuted forthwith. Consequently, it is likely that no food product is of a more satisfactory grade of quality than the milk supplied to those cities and towns of Victoria, where the Milk and Dairy Supervision Act is enforced.

Not only as an administrative movement, protective of the public health, but as an economic proposition that has benefited largely those who are engaged in the business concerned, this Act stands out prominently

as an example of successful legislation. It came into force in the Metropolitan Area in July, 1906; and the officers intrusted with the carrying out of its regulations had the task before them of raising the standard of the production and distribution of the milk supply, while at the same time it was incumbent on them to effect that result as economically as possible for the dairymen. As might have been expected under such divided control, or want of control, as previously existed, they found dairying being carried on under very varied conditions. A few places were fairly satisfactory. In some others, a little better attention to sanitary detail, and some inexpensive constructional improvements, were all that was asked for. But there were certain places where the conditions under which milk was being produced and handled were vile. These latter conditions were found to arise from ignorance, carelessness, and, in some cases, even from wilful disregard of reasonable cleanliness.



INSANITARY DAIRY CONDITIONS.

Under advice, admonition, or threat of prosecution, according to their respective class, many of these keepers of insanitary dairies improved both their premises and condition of working; and ultimately received the statutory licence which marks premises as satisfactory. A few others are still on the "withheld" list, which indicates that while their premises are not insanitary, they have not been kept consistently satisfactory. Those who either could not, or would not, improve in their methods, have had their application for licence refused; and in such cases further sale results in prosecution.

The Licensing Provisions.

The scope of this Act is sufficiently comprehensive to include under its provisions all premises from which milk is distributed in even the smallest quantity, either through sale or barter. Where any such disposal of milk takes place, a licence fee must be paid, and the premises and stock

inspected. The giving of milk in return for fodder or other commodity, for cattle pasturing, for services rendered, or any other sort of barter, is equivalent to a sale, and a licence must be applied for.

Before the Act came into force there were many so-called private people who kept from one to several head of cows, ostensibly for the purpose of supplying their household with dairy produce. When surplus milk was on hand they sold to their neighbours; and, in order to gain custom, it was too frequently sold at a price much lower than that charged by the dairymen. The bulk of this private milk selling took place in the spring when grass, and, consequently, milk also, were most plentiful. At other seasons, these people usually had only enough for their own requirements, for their cattle had generally to sustain themselves on such scanty grazing as might then be found on the unfenced suburban allotments.

In order to hold trade, a legitimate dairyman must maintain a regular supply of milk to his customers the year through; and during the autumn and winter months he frequently does this at considerable expenditure for fodder for his cows. During the spring and early summer months, when milk is plentiful and comparatively cheaply produced, the dairyman expects to recoup himself for the extra outlay incurred in keeping up the supply during the months of scarcity. Should he, however, meet with competition from unlicensed people, who, by underselling him in the spring, reduce his trade at that season, his case is hard; and much of this actually occurred before the advent of Government supervision. Now all are on the same footing in regard to licence fees and inspection; and private cow-keepers must either apply for licence or refrain from selling. In most cases they adopt the latter course, while those who pay the licence-fee find it unprofitable to charge less than trade prices for their milk.

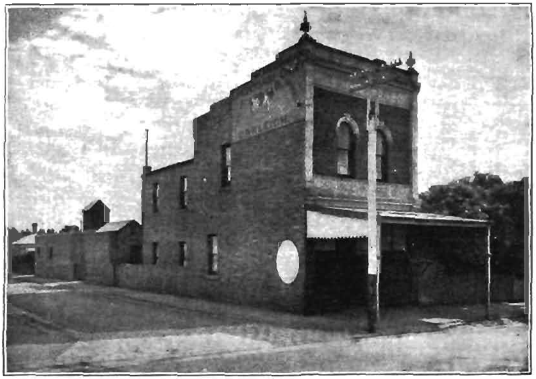
Advantages to the Trade.

Another drawback to legitimate trade which formerly existed arose from those dairymen who were known as "cutters," or retailers of cheap milk at all seasons. Some few years ago, the dairying business was rendered very unsatisfactory through the number of men who carried on this cutting or underselling of their trade competitors as a regular procedure. At that time, it was generally supposed by those in touch with the trade that "cutters" were also sellers of inferior quality milk. Subsequent events showed this conclusion to be correct in numerous instances; for the samples of their milk taken in the course of its distribution resulted in repeated prosecutions, until finally they either sold good milk at the usual price or went out of the business. With the abolition of unlicensed cow-keepers and those whose premises were kept in an insanitary condition, and through the sale of inferior milk at low prices having become unprofitable to the cutting fraternity, dairying as a business has greatly improved during the past five years. Those who were at first opposed to central supervision are now its strongest supporters; and many dairymen freely acknowledge that the Government system of supervision has been the making of their business. One of these, a large trader, volunteered the information that for several years prior to its inception he had barely held his own in trade competition; but, during the three years following the Government taking over the supervision, his business increased over 30 per cent., and it has kept on improving.

ADULTERATION AND THE CREAM SUPPLY.

Adulteration of milk is most generally effected by the addition of water or skimmed milk. The adding of water reduces the proportionate amount of the whole of the milk solids in a given sample, whilst skim milk reduces its quality in butter-fat only. In either case, the customer buying the mixture is defrauded.

Many people seem to think that their dairyman should be able to supply cream as well as milk at any season of the year at a few hours' notice. To do this honestly, would necessitate the dairyman having a quantity of surplus milk above that required for ordinary distribution; but, excepting in the spring, such a surplus is almost impossible to obtain. Dairymen frequently complain of the unreasonable attitude of some customers who threaten to buy their milk elsewhere if cream is not also



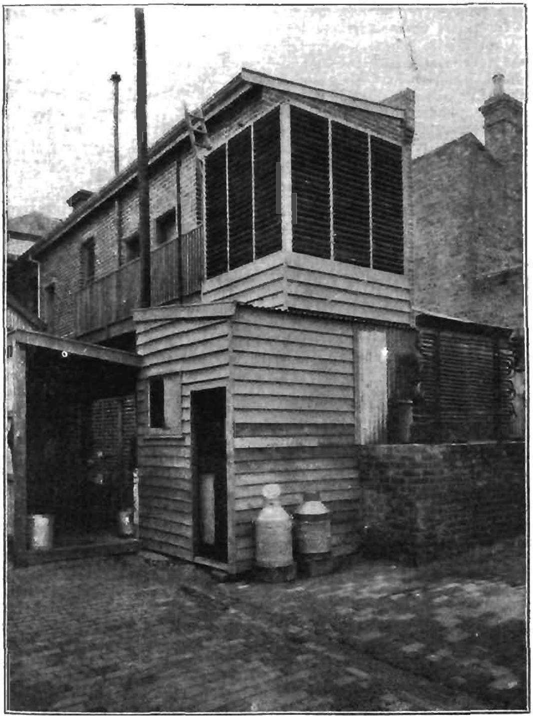
LINCOLNSHIRE DAIRY (W. MERRIMAN, MALVERN).

supplied on casual order. It may happen that cream cannot be purchased anywhere at the short notice given, so the milkman must then take the chance of losing a customer through not supplying it. The only other course open to him in such a dilemma would be to skim a portion of the cream from the bulk milk he had on hand for retailing. If he did this, he could not supply his regular customers from the milk he had left, so he would be compelled to mix the skimmed with the unskimmed milk, and distribute it as pure milk. This would leave him, if detected, open to prosecution—a risk few dairymen care to take in order to supply an unreasonable customer.

Where the demand is a regular one, cream is purchased from farmers who separate their milk. There is an increasing inquiry at present for scalded cream in the city and suburbs; and some farmers have under consideration the catering for this as a special trade, which will be something of a boon to dairymen who have casual customers for such produce.

The Butter Fat Standard.

Regarding the 3.5 per cent. butter-fat standard, as fixed by the Pure Food Standards Committee, some retailers aver that it is unreasonably high; but a large majority are satisfied with it. A most significant fact in its favour is the very small number of milk samples taken that have



SUBURBAN DAIRY (W. J. SIBBITT, HAWTHORN).

been below the standard. It is still more rare to hear of a retailer with his own farm selling inferior quality milk. Such dairymen are most emphatic in their approval of the standard. The quality, purity, and freshness of their milk all combine to bring them trade, and they can

readily sell all they can produce. At the same time, it is recognised that in the spring flush some cows do give milk that is not quite up to standard quality during at least a short period after calving; and if there were many such freshening in a herd at the same time, the owner might be called to account on the quality of his milk as estimated on its butter-fat content. There is little chance of this occurring where a farmer keeps up a regular supply of milk the year through, and arranges that his cows will freshen at different months throughout the year.

A cow's milk is at its lowest butter-fat content in the flush of the few weeks subsequent to each calving; and, as the period of lactation lengthens the milk increases in quality and becomes normal at some six to eight weeks after calving; then it is usually several points above the required standard. Thus, where the milk supply of a farm is kept up to a regular quantity throughout the year, there is always enough of the richer milk in the bulk yield, if properly mixed, to more than counterbalance any slight deficiency that might occur in the milk of a few freshly calved cows.

Cheap Milk.

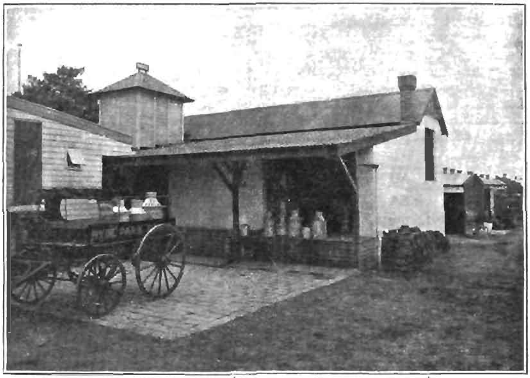
The retail dairyman's inherent desire for cheap milk may, however, at times get him into difficulties unexpectedly. With the incoming of summer, there is always an increased demand for milk, arising from the extra quantity required in making ice-cream and for liquid refreshments. Outside the suburban radius there are many farmers who carry on their dairying on the natural pasture alone. They claim it does not pay to hand-feed, so they dry off their cows in the autumn; and work is suspended till they all freshen again in the spring when grass is plentiful. Not being to any expense or trouble in regard to winter feeding such dairy-farmers have no lee-way to make up, and are ready to sell their milk at a cheaper rate than they would otherwise do if they had to hand feed to supply a regular trade. A dairyman with an increased spring trade may be tempted by an offer of cheap milk from one of these farmers, heedless of the fact that, if the cows producing it are all freshly calved, their milk will be at its lowest quality. If it so happened that this cheap milk were sampled and its owner fined, the standard would be said to be too high; when it was really the dairyman's anxiety to make a little extra profit that caused his downfall. A fair price for good milk is the best trade motto.

Many retail dairymen who are supplied by several farmers pay a retaining fee for the services of an expert analyst who tests the milk of each supplier as often as may be required. Should any fault be found the dairyman can then take steps for his own protection. Misstatements are, however, known to occur in this connexion. On one occasion, a farmer, being informed by his retailer that his milk was not up to standard quality, applied to the Board of Health for his milk to be tested on the farm. This was done, and from over thirty samples taken at different milkings there was an average result of 4.5 per cent. of butter-fat; and none of the samples went below 4 per cent. Evidently a misstatement or deliberate adulteration had taken place somewhere; but at least the result exonerated the cows. Those dairymen who retail milk from their own herds find no necessity for retaining the services of an analyst; as the standard does not cause them any uneasiness.

Development of Refrigeration.

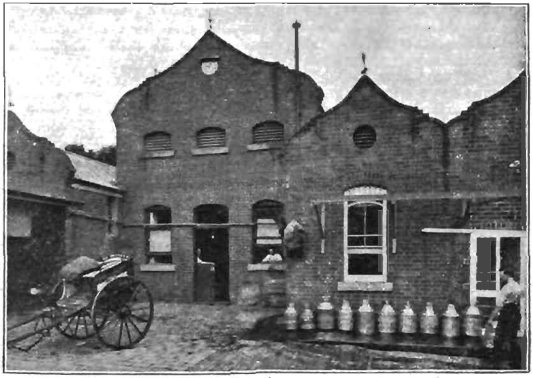
Legitimate competition improves trade, and improvement in condition of premises generally follows, in order that trade may still further in-

crease and be successfully handled. Results show that, in the dairying business, owners are no way behind other tradesmen in thus pushing



HYDE PARK DAIRY (H. THOMPSON, GLENFERRIE).

forward their business opportunities. Owing to the removal of some of the disadvantages affecting the dairying business, as referred to in the



COTSWOLD HILLS' DAIRY (W. WHITE, HAWKSBURN).

foregoing pages, many of the city and suburban dairymen have largely increased their sales. The buying and selling prices of milk are also

now more uniform, and contracts can now be entered into with a freedom that could not be ventured before. The result is that an all round improvement is being made both in the construction of premises, and in methods of handling produce.

Five years ago the use of the dairy refrigerator in connexion with the handling of fresh milk was confined to two metropolitan firms. In very many instances, even ordinary cooling of milk was neglected. Under such treatment, milk could not be expected to retain its freshness; and it frequently turned thick or sour before the customer could use it. Now, almost every dairyman makes use of ice in some way during the summer; some by standing the milk cans in iced water; others have large ice-chests to store in; while a considerable number have erected refrigerating machinery and cold storage rooms on their dairy premises. Several of these last mentioned cater for the trade, either by selling properly cooled milk at wholesale rates as required, or by cooling and storing milk for others. To fit up a refrigerating plant is an expensive item to the dairyman, but it is a money-saving procedure right from the outset. Some dairymen claim that they have saved the cost of the installation within one year, through prevention of losses from souring; but this is perhaps somewhat of an exaggeration.

The cost of running the average dairy refrigerator may be set down at from 12s. to 15s. per week, and this is frequently more than covered by the amount received from other dairymen who pay the usual storage rate of 1s. per can per week. Several dairymen who now have their own plants were formerly paying 15s. to 20s., and over, per week for storage accommodation; and were at much loss of time travelling to and from the ice-works with their milk. Also, owing to imperfect cooling, much milk was lost in the storing. Altogether, a reasonable estimate of actual saving by having the plant on the premises might run to £50 per year; and, besides this, there is the profit arising from the increased trade that the cool storage promotes. Refrigeration is an insurance against loss; it holds custom; and it is one of the greatest aids to the building up of a milk business.

Until some experience has been gained in cold storage, many dairymen are slow to realize the full advantages of thorough and quick cooling. If milk is at all warm, the standing of it in cold water or in a cold room does not at once prevent it from deteriorating in condition; it must be properly cooled before it is safe. In order to check the development of acidity, milk must be cooled down to below 60 degrees Fahr. When a can of milk above this temperature is placed in cold water or in an ice room, the outside portion of the milk cools quickly; but, unless it is repeatedly stirred, it will be some time before the milk in the centre of the can becomes cooled; and it will be deteriorating meanwhile. When such a can is taken out for distribution and the milk is mixed up, the whole will soon turn sour. A similar happening may occur through standing a can of milk in water that is lower in level than the milk in the can. In this case, while the milk below may be cooled to the water temperature, that above the water line will tend to remain at the higher temperature of the atmosphere, and the whole will be spoilt. Until the reason is explained to them, dairymen are frequently at a loss to account for milk thus cooled going bad

Cooling on the Farm.

The most common complaint retail dairymen have against their farm suppliers is their lax method of cooling in hot weather; and many a

farmer has lost a good customer through carelessness in this matter. If carefully carried out, the usual cooling on the farm by means of well water running through a cooler will bring milk down to the required temperature. In the colder months, the temperature of the atmosphere assists in this work; but in warm weather it retards it, and this point is often overlooked. In warm weather, the milk should be passed very slowly over the cooler in order to take full advantage of the cold water; and if the heat is not taken out of the milk in one cooling, it will pay to run it over again. This second cooling will reduce it to the temperature required; and it will have a chance of reaching the retailer in a satisfactory condition. When a farmer contracts to supply milk he should do his best to see that the buyer gets it in good order. It is unreasonable to expect payment for milk that cannot be sold; and to get such milk from a farmer disorganizes a dairyman's trade, causing him not only loss of time but also of custom.

One of the principal advantages of the refrigerator to the dairyman lies in the facility given for the quick and thorough reducing of the temperature of the milk by use of the brine cooler. Once cooled, it is not a difficult matter to keep milk cool; but, as mentioned, if this is not done quickly the milk soon spoils. With brine cooling, it is usual to reduce the temperature of the milk to about 45 degs., and maintain it at that, or lower, in the ice-room until sent out for distribution.

PASTEURIZATION.

The use of preservatives in milk is forbidden by the Pure Food laws; and, with present-day methods of refrigeration and pasteurization, there is no necessity for them. Regarding the advantage or otherwise of pasteurizing milk for household use, there is some difference of opinion; and, as to which process has the most advantages in regard to milk for use in the nursery, even doctors differ. However, there does not appear to be any question that milk from healthy cows milked under cleanly conditions is as perfect a food as can be desired for either infants or adults; and, if such milk is at once subjected to refrigeration, and kept at a low temperature until it goes into consumption, it is then just as sweet and wholesome as when taken from the cow.

On the other hand, if there is any doubt as to the health of the cattle, or the conditions under which milk is either produced or handled are not as sanitary as could be desired, the pasteurizing of the milk may be looked on as a necessity. Coming from a healthy cow, milk is pure and healthful; but, if not carefully handled, it may become contaminated through contact with dust or flies, and disease germs may be introduced into it by such means. The heat to which milk is subjected in pasteurizing will destroy disease germs; and it is as a counterbalance to possible contamination that pasteurizing is more generally advocated. It is a corrective for conditions which should have been prevented.

Though pure milk is not improved by the process, yet pasteurizing milk enables it to be kept in a wholesome state under conditions which would be altogether outside consideration without it. Milk pasteurized, and sealed from contact with air, will keep sweet until some time after it is unsealed; and, as a standby where fresh milk cannot be regularly obtained, it is in good demand on this account.

MILKING METHODS.

Another subject that has caused discussion among those interested in the fresh milk trade is the comparison, from a sanitary standpoint, of

machine and hand milking. Either method may be bad and both methods may be good. If kept scrupulously clean, the machine has an advantage over hand milking, as it conveys the milk under protection of the tubes from the udder of the cow to the covered receiving bucket; thereby removing all risk of its being contaminated by flies, dust, or other dirt. In order to be satisfactory, hand milking calls for unremitting care in keeping the cows well groomed, and the milking shed and surroundings free from accumulation of dirt of any description. It is impossible to keep cattle in a perfect state of cleanliness in all weathers and at all seasons. This is universally recognised; and therefore those milking conditions that were the best possible under existing circumstances have in the past been considered satisfactory. With the improvements that have been made of recent years in milking machines, they have reached a standard of efficiency that has brought them into fairly general use in many districts; particularly where the scarcity of labour had previously

VICTORIA DAIRY (E. A. ADAMS, ST. KILDA).

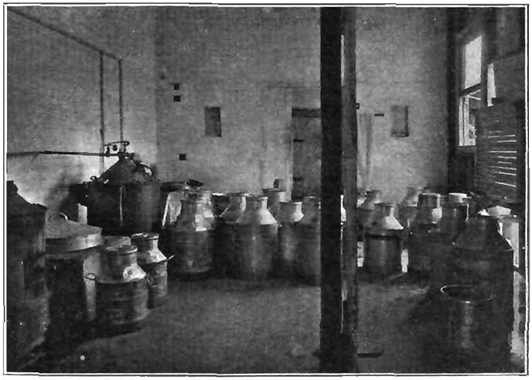
been a hindrance to dairying. With their use the standard of cleanliness in milking has been raised much above what previously was the best.

Distribution.

Pursuing this subject of a perfect milk supply a little further we come to the item of city distribution; and, apart from its expense, nothing can at present equal the bottle system. A few firms are already distributing milk by this method; and there are indications of the practice becoming more general before long. In the outer suburbs, where the air carries comparatively little dust, and the trade is in the hands of clean and careful people, milk distribution by hand can and measure may be looked on as fairly satisfactory; but in the city and more closely-populated suburbs, and especially during the drier months, it must be conceded that this system might well be improved on. Hand cans are opened and filled from the larger cans or floats in the dusty streets; and are opened

again to measure out milk to each customer, risking possible contamination on every such occasion.

The one thing that stands in the way of general bottling for distribution is the expense that is incurred by dairymen through breakages. If a cheaper or more durable, as well as lighter, bottle or other package were obtainable, the system would more quickly find favour. The bottles do away with any suggestion of short measure being given; and it is the only satisfactory solution to the difficulty arising from adulteration of milk by the employé distributing it. Dairymen have been frequently fined for selling watered milk, when it was the employé who should have been dealt with. Unscrupulous men have been seen to adulterate their employer's milk in order that they might sell a few extra quarts on the round, and pocket the proceeds. While prosecution of employés has done much to check this practice, there would be less opportunity for fraud if the milk were sold in sealed bottles.



UNION DAIRY (MORRIS BROS., SOUTH MELBOURNE).

Ideal conditions for a city milk supply would thus appear to be its production on the farm from healthy cattle kept amidst clean surroundings, cooled by refrigeration, bottled, sealed, and delivered cold to the customer. The cost of railway carriage and work of handling are, however, prohibitive of milk being conveyed far in that way; and only dairy farmers within easy driving distance of the city could afford to bottle and send the milk out direct from the farm. The next best method, therefore, of handling the city supply is the thorough cooling on the farm, and forwarding the bulk in cool trucks to distributing depôts on the open outskirts of the city, to be then bottled and sent out without delay.

The work of retailing milk under the individual owner system, as at present in vogue, is often spoken of by observers as being very expensive to the dairymen on account of the great area that is travelled over by each cart in working the several rounds. Among the many suggestions that have been put forward for remedying this are municipal, co-operative,

or large proprietary depôts, from which the whole of the milk for each suburb, or group of suburbs, might be distributed; the carts each delivering to all the houses on a given route. This would certainly do away with much of the travelling that the present rounds call for; but it would also close out all competition and individual effort; which very probably would not be to the benefit of the public. As matters now stand, they have a choice of several dairymen in every district, both in regard to hour of delivery or individual fancy in quality of milk supplied. Every dairyman also has some customers whose trade he values so highly that he would go a long way out of his usual route to serve them. It is in following customers such as this who have moved to another locality, that a dairyman often increases his round, as their recommendation will bring him more trade. Taking everything into consideration, the present working system appears to be fairly satisfactory for both consumers and suppliers.

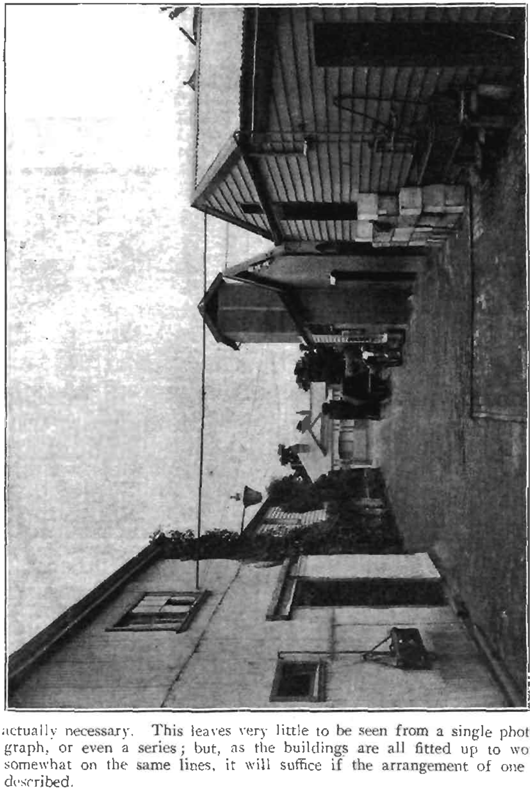
Facts, Figures, and Worthy Examples.

The increase in trade that has been mentioned as having taken place in the retail business may best be demonstrated by a few figures. There are, altogether, 26 dairymen in Melbourne and suburbs whose premises are now fitted with refrigerating plants. These are Messrs. Evans, in Brighton; Cook, in Camberwell; Morris, in Carlton; Hopton, in Collingwood; McKeever, in Essendon; Atkins, and Larcher, in Fitzroy; Flockhart, in Flemington; McFarlane, in Footscray; Sibbitt, and Thompson, in Hawthorn; Rout, and Simonton Bros., in Kew; Coughlan, Jenner, Merriman, and Woodmason, in Malvern; Affleck, Shinkfield, and White, in Prahran; Adams, in St. Kilda; Oakes, in Richmond; Smith, in North Melbourne; Dobelli, and Morris Bros., in South Melbourne; and the Willsmere Certified Milk Co., in Melbourne City. There is also Mr. Hope's dairy farm in Caulfield which is not included in these, as the milk from there is retailed by other dairymen mentioned. Messrs. Rout and Woodmason retail from their dairy farms, running both branches of the business on the same premises. These 26 dairies represent a daily distribution of 28,690 quarts of milk to 28,696 customers. Several of these dairymen supply shops and other small retailers; so the number of customers to whom this milk is distributed is much larger than the figures show. On the average, the distribution is less than a quart per customer.

Among the larger dairies with refrigerating plants installed, a few examples will suffice to show what has taken place. In individual instances increases have been made in sales of from 400 quarts to 800 quarts; 1,500 to 4,500; 250 to 800; 800 to 1,500; 650 to 1,300; 100 to 600; and 180 to 880. On the whole, in regard to the 26 dairymen whose names are given above, the daily distribution has advanced from 16,795 to 28,790 quarts; while the number of customers directly supplied by them has increased from 14,284 to 25,096. This large increase has not been gained altogether by canvas or recommendation, as occurs with those in a smaller way; but has largely been made up from the purchase of smaller rounds. Many cow-keepers have moved from the inner suburbs to further out; and have disposed of their retail portion of the business; and for reasons previously given many other small rounds have changed hands, and the men with ready capital have gathered them in. However, the purchase money has all been derived from the direct profit in the milk trade; and when the public hears that the price of milk has to be raised because the business is not

paying, they may understand that it is at least not a question of starvation with their dairyman.

Photographs are herewith presented of a few of the dairies mentioned. Owing to the nature of the work, the handling must be done under shelter; and, for convenience, the plant is not spread out over more space than is



MODEL DAIRY (SIMONTON BROS., KEW).

actually necessary. This leaves very little to be seen from a single photograph, or even a series; but, as the buildings are all fitted up to work somewhat on the same lines, it will suffice if the arrangement of one is described.

The Model Dairy, owned by Messrs. Simonton Bros., of Kew, is one of the oldest and best arranged of these modern dairy outfits. It stands

on a ¾-acre block in Belmont-avenue, where the business has been established for fourteen years. The refrigerating plant was installed five years ago. This place handles 1,575 gallons of milk, and 1,000 pounds of butter weekly. The butter is from one of the best Victorian factories; and is printed specially for this retail trade. The milk is produced on two farms near the outer boundary of the suburb, and is brought in from there, morning and evening, by the dairy waggon. As it is milked it is passed over the cooler; and is ready for transport to the dairy within a few minutes after the milking is finished.

Looking at the picture of the Model Dairy on page 309, the bricked entrance way, with neatly trimmed hedge bordering it, is seen towards the back. To the left, are the stables and waggon shedding. Across the 40 feet roadway, on the right stand the dairy buildings, covering an area of about 22 feet by 75 feet. At the end nearest the entrance is the engine-room 9 feet by 21 feet inside; and fitted with 6½ h.p. Crossley

MILK TESTING ROOM, WILLSMERE CERTIFIED MILK COY., BOURKE-STREET.

gas engine, rotary brine pump, and 2-ton Werner compressor. The milk cooling room and ice chamber adjoin this. The cooling room is 12 feet by 9 feet; and the chamber has a floor space of 10 feet by 11 feet.

As the milk waggon arrives from the farm it backs in at the place where the cans are standing in the photograph. Above this, cans are seen standing on a platform inside the building. This is at a window provided with sliding shutter. As the waggon backs in, the cans are transferred through this window to the platform, which is above the cooler; and no lifting is necessitated. The window being closed, the milk is poured into the 100-gallon receiving vat; and cooled over brine to about 45 degs. F., and then placed in the ice-chamber till the carts are ready to go out.

The cool chamber is fitted with a small electric fan to keep the air in circulation; and a temperature of 34 degs. F. is maintained. On the other side of these rooms from the engine-room, and nearer to the front

of the picture, is the distributing room for both milk and butter, 13 feet by 21 feet; and from this the cans and boxes are loaded to the carts. These rooms are of brick with concrete floor, well ventilated, and lighted by electricity for early morning and night work. Across a 4½ feet passage-way from the distributing room is the washing and can room. This is 15 feet by 21 feet, with bricked floor; and fitted with copper, troughs, and steam spray, with hot water laid on from the boiler room adjoining. A butter box recess and milk testing room complete this building. The property is sewered.

The rest of the block is taken up by the dwelling and garden; and both the condition in which the premises are kept, as well as the arrangement and fitting up of the buildings, justify its being named "The Model Dairy."

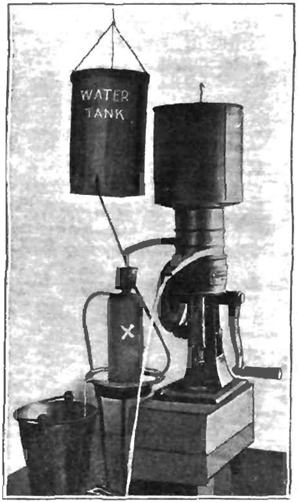
Among the number of dairies mentioned the two which do the largest business, and which have also been the longest fitted up in regard to refrigerating appliances, are those of the Willsmere Certified Milk Coy., in Bourke-street, Melbourne, and Messrs. Larcher and Sons, of Moor-street, Fitzroy. Between them, these firms handle about 18,000 gallons of milk weekly; and, to supply their clientele, numbering in each instance upwards of 3,000, they carry a large vehicular equipment and staff of employés. The supply of each is drawn from several districts, and from numerous farms. Members of both firms are well known in every milk-producing district supplying the metropolis; for both make a point of inspecting the farms from which they draw their supplies. The Willsmere Co. makes a speciality of bottled milk, a particular line of which is put up especially for infants. Their supply for the latter is drawn from the farm of Mr. O. Syme at Gisborne, which is laid out on sanitary lines and fitted with refrigerating machinery and cold storage room. The working of several similar farms, such as Messrs. Woodmason of Malvern, Hope of Caulfield, and Rout of Kew, has previously been described in this *Journal*, and so there is little fresh to be mentioned in regard to the conditions at these premises.

Reviewing the foregoing, it will be seen that, as the dairying business has made progress, there has been a general tendency to improve the keeping quality of the milk by careful handling. None were more fully aware of the shortcomings of the daily supply than those engaged in its distribution; but the condition of the trade checked any steps being taken towards improving them. There was always the question as to whether the retailer of pure milk from sanitary premises would be able to hold his ground, or be crowded out of the business by the vendors of skimmed, watered, and dirty milk. The administration of the Milk and Dairy Supervision and Pure Food Acts has changed this, and the trade and the public generally have benefited.

CREAM COOLING ON THE FARM.

M. Comans, Dairy Supervisor.

Now that such a large number of hand separators are in use attention should be directed to the better treatment of cream from the time it is separated until it is delivered at the factory. Speaking from nearly five years' experience as a Dairy Supervisor, I am compelled to say that at only one farm have I observed a proper system of cooling and aerating cream. The usual method is to collect each separation into a bucket and to trust to the atmosphere in the dairy to do the cooling.



CREAM COOLER AND AERATOR.

The disadvantage of such a system, or rather lack of system, is apparent. The cream standing for several hours with the animal heat in it is an ideal medium for the growth of undesirable organisms. Also, if cows are fed on any kind of pasture or fodder which imparts a distinctive taint to the cream, such taint is not removed, as happens when cooling and aerating are carried out.

At some farms, a rough method of cooling is practised. The cream is divided into several small vessels, and allowed to stand in a tub of cold water until the temperature is gradually reduced, but such a method is so slow as to be almost worthless, besides lacking the advantage of aeration. Further, when the cream is finally collected into one can, preparatory to being sent to the factory, some waste is occasioned through a quantity adhering to the sides of the small vessels.

The accompanying illustration is of a cream cooler and aerator, invented and patented by Mr. D. M. McDonald, and used by him at his farm at Donnybrook. The cooler is a small cylindrical shaped tinned copper vessel, with openings at either end for the inlet and outlet of water. A small detachable cup with perforations is placed on top to distribute the cream, which flows in a thin film over the cooler as may be seen in the illustration.

At Mr. McDonald's request I witnessed a trial on one of the coolers a few weeks ago. The following is the result of the trial :—

Temperature of cream before cooling—88 deg. Fahr.
Temperature of cream after cooling—66 deg. Fahr.
Temperature of water used—62 deg. Fahr.
Temperature of atmosphere in dairy—68 deg. Fahr.

It will be seen that the temperature of the cream was reduced by 22° Fahr. If colder water had been available, the result would have been proportionately better. Only 3 gallons of water were used for every 10 gallons of milk separated. The coolers are made in two sizes. The price of one large enough to treat the cream from a 45-gallon separator is £2 10s.

THE INFLUENCE ON THE PRODUCTION OF MUTTON OF MANURES APPLIED TO PASTURES.

William Somerville, M.A., D.Sc., Professor of Agriculture in the University of Oxford.

ABSTRACT BY

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist of Victoria and Professor of Botany and Plant Physiology in the Melbourne University.

The foregoing work, issued as a supplement to the *Journal of the Board of Agriculture*, is of so much importance that it seems worth while to publish an abstract of it for the benefit of graziers in Victoria. The experiments were carried out upon a quite unusual plan, namely, by treating pastures in various ways and weighing the sheep grazing upon these pastures at regular intervals of time. In this way the nutritious properties of the herbage are tested equally with its bulk, whereas the ordinary method of testing a hay crop by bulk or weight alone, may frequently yield misleading results, when a particular manure or mode of treatment has encouraged a large growth of the more innutritious grasses.

The experiments in question were begun in 1896, and have been continued up to the date of preparation of the present report. They were carried out at various stations in different parts of Great Britain, and there can be little doubt that the broad general principles established during the progress of the work, will apply with comparatively little modification all the world over. One of the most important tests was as to the effect of feeding cake to the sheep, both from the point of view of its direct effect on the animals in seasons when they received it, and also of the indirect effects showing subsequently on the pasture, as the result of the manuring it had received by the cake residues. It was found that, in the conversion of store-tegs into mutton by summer grazing, the use of cake all through the season resulted in a direct loss, and not only was this the case, but even when the after effects upon the pastures were included, the net gain was not sufficient to make the practice appreciably profitable in the most favourable cases, and in the others still resulted in a dead loss. Professor Somerville concludes that, if a pasture is so poor that it will not fatten stock, it is little or no use attempting to make good the deficiency by the use of cake or other artificial food, but that the first thing to try is whether the grass land responds to treatment with phosphates, and if so, to dress with basic slag fairly heavily, 5 to 10 cwt. per acre not being at all excessive. After such manuring, the use of cake is actually antagonistic to the improvement of the pasture, since the nitrogen in the manurial residues of the cake encourages grasses rather than the clovers, which the basic slag brings to their maximum development.

The use of lime was not found to be profitable for improving pastures, when applied in the form of heavy dressings (4 tons to the acre, &c.), the improvement shown in the first few years in certain cases being evidently due to the lime hastening the liberation of the nitrogen already present in the soil, or at least being only shown in cases where the soil contained a fair quantity of humus.

Similarly, the addition or separate use of potash and nitrogenous manures was found to be unprofitable. The phosphatic manures stimulate the clover, whereas the nitrogenous manures stimulate the grass which smothers the clover, so that, in pastures, the two manures are to a large extent antagonistic to each other. In addition, although the nitrogenous manures stimulate an early and luxuriant growth of grass, this is deficient in feeding properties and produces less meat than the smaller yield grown by phosphate alone.

Another interesting comparison was made in regard to the effects of equal quantities of phosphoric acid in the form of basic slag and superphosphate respectively. In every case, the basic slag produced the greater amount of increase in the live weight of the sheep. This is a conclusion of considerable importance, since there does not seem to be any reason why the same conclusion should not apply under Victorian conditions to Victorian pastures. The fact that superphosphates are specially valuable to the early growth of grain crops, does not show that they will be equally valuable for manuring pasture land, where what is needed is not so much a short stimulating action, but rather a prolonged one, whose effects will suffice to keep the pasture in good heart over several years.

For the details of the work and the methods of observation employed, the reader is referred to the original publication, but as this is perhaps the most important work on the manuring of sheep pastures that has been issued for some time, it may be worth while to give in detail, the author's summary of the results to be drawn from his experiments. These are as follow :—

SUMMARY OF RESULTS.

1. Cake of various sorts was fed to sheep on pasture at eleven centres, and in no instance was the outlay on the cake recovered in the increased mutton produced by the sheep in the season when the cake was consumed.

2. In the latter part of the grazing season sheep getting liberal allowances of cake did not increase in weight to a greater extent than those getting no cake, but which were grazing pasture improved by liberal dressings of basic slag.

3. The residual values of cake were occasionally higher than is usually estimated, but, in comparison with basic slag, cake-residues had a poor ameliorative effect on the pasture.

4. Even when both direct and indirect effects of cake are taken into account, the original outlay was not recovered at two of the three main stations. This result was confirmed at such of the minor stations as were concerned with this problem.

5. It would appear to be bad practice to feed cake on pasture containing much clover, as the nitrogen in the cake residues has a tendency to repress the clovers by stimulating the non-leguminous plants.

6. Common burned lime, used alone at the rate of 4 tons per acre, has proved very ineffective; but smaller dressings of ground lime, when added to a phosphatic dressing, have sometimes been justified.

7. Basic slag, applied as a single dressing at the rate of half a ton per acre, has generally proved a most effective agent in improving the feeding value of pasture, and its effects are not nearly exhausted at the end of nine years.

8. It has proved much more profitable to apply a heavy dose of basic slag as a single dressing, than to divide it into two equal portions and apply these with a three years' interval.

9. A repeated dressing of basic slag has, however, had a marked effect in some cases, and the productiveness of slagged pastures that are showing signs of exhaustion can be rapidly improved in this way. The action of a repeated dressing appears to be more rapid in many cases than the action of the first dose.

10. Basic slag put on in the middle of June (December, in Victoria) had much more effect than the same quantity applied in winter. Whether this result is of general application can only be determined by further experiments.

11. Where a direct comparison has been made between the effects of equal quantities of phosphoric acid derived from basic slag and superphosphate respectively, the former manure has always produced the greater amount of live-weight increase. When the cost of the manure is taken into account, the profits from the use of basic slag have always been much greater than those from superphosphate.

12. Potash added to a phosphatic dressing generally resulted in the production of more live-weight increase, but this increase was not a profitable one. The expediency of using potash on pastures—as contrasted with meadows—therefore receives no support from these experiments.

13. The addition of moderate dressings of sulphate of ammonia or nitrate of soda to land already treated with phosphate has increased the yield of herbage, but has, as a rule, reduced the yield of mutton. The use of nitrogenous manures on pasture would, therefore, appear to be bad practice.

14. Dissolved bones compare badly with basic slag and superphosphate. This is doubtless due to two reasons :—(*a*) the slower action of part of their phosphate, and (*b*) the presence of nitrogen. But the nitrogen of dissolved bones, being less active than that of sulphate of ammonia, the general effect on the sheep of the dissolved bones has been better than that of a mixture of superphosphate and sulphate of ammonia. The use, however, of dissolved bones on pasture would seldom appear to be justified, especially as their phosphoric acid costs more than the same substance in the form of basic slag.

WINTERING BEES.

F. R. Beuhne, Bee Expert.

At the end of the honey season every bee-keeper should make a thorough examination of his stocks to ascertain whether each colony has a fertile queen, a sufficient force of worker bees, and enough honey to carry them through till September or October. To get bees successfully through the winter months is a most difficult problem in North America and Northern Europe, especially where the rigour of the climate makes cellar-wintering almost a necessity.

In Australia, we have no such difficulties, and in consequence bee-keepers pay too little attention to the subject of wintering so far as the condition of their colonies at the beginning of winter is concerned. Yet it is the condition of a colony, as to quantity and quality of stores, age and vigour of queen, and number of worker bees at the end of one season, which largely determines the prosperity of, and the yield of honey from, that colony in the season following.

Packing of hives, as practised in colder countries, is not necessary here, but upper stories of empty combs should be removed from the hives, taken indoors, and stacked up and secured against bee moths. The removal of all spare combs and boxes does not only prevent loss of animal heat by radiation, and the unnecessary consumption of stores to replace this loss, but it also compels the bees to store any thin honey, which they may still gather, into combs covered by bees; it will there ripen, instead of souring as it does when stored in combs outside the cluster of bees. Watery honey, when consumed during inactivity, is without doubt detrimental to bees, particularly when it contains such a high

APIARY SHOWING HIVES SHUT DOWN FOR THE WINTER.

percentage of nitrogenous matter, as is present in the honey from our winter-flowering iron-bark trees. The consumption of watery food during winter causes ordinary dysentery, and probably also provides a suitable medium for the multiplication of the *Nosema apis* parasite and the growth of fungi in the intestinal tract. At the same time, the more rapid accumulation of fæcal matter in the intestine compels the bees to take cleansing flights during unsuitable temperatures, resulting in loss through chilling and failure to return to the hive.

Methods of wintering differ with bee-keepers, and also in localities. Some leave the supers on the hives whether full or empty, others put the empty stories underneath the brood chamber, while yet others remove the supers altogether and shut the bees down on the combs of the single brood chamber.

With a favourable winter and colonies strong, there is little, if any, difference between the three methods. But colonies are not always strong at the end of the honey season, and the character of the coming winter cannot be anticipated. It is therefore best to take no risks, but shut the

bees down to a single story, which will give the best results under all the varying conditions of strength in bees and climatic influences. When colonies are left with one super full of ripe honey, in addition to the brood chamber, they winter well. But not many bee-keepers are prepared to leave so much honey in the hives, which is not needed by the bees and represents in a large apiary a considerable money value which cannot be realized till the following spring. At the same time, there is a risk of some of the honey granulating in the combs, and then it cannot be obtained except by the destruction of the combs.

When supers with empty combs are left on, the heat generated by the cluster of bees escapes upwards and the bees sometimes follow it and establish their seat between the empty combs. Some of the honey is carried up by this means and the operation causes unnatural activity, greater consumption of stores, and wearing out of bees.

With the empty combs put below the cluster of bees, the same advantages of conserving heat and ease of occasional examination are secured, as when bees are wintered in a single hive body. But combs below the brood are apt to become rather dirty, and sometimes mouldy.

Since it has become known that the *Nosema apis* parasite is present in almost every apiary, there is an additional reason for the removal from the hives of all combs not required by the bees during winter. According to Dr. Zander, the discoverer of *Nosema apis*, the chief source of infection is the combs soiled with the fæces of diseased bees. During the working season, bees void their excrements outside the hive; moreover, the life of the bee during active field work in summer is so short that infected bees wear out in the natural course of events before the disease has reached the final stage, as in the case of the bees which came through the winter.

The removal of all surplus combs, at the end of the season, will therefore do much to keep them free from the infection, which undoubtedly would take place during winter should an outbreak of malignant dysentery occur. Thus, only one set of combs would have to be boiled down, instead of two or more. In the case of small colonies, the reduction can be carried still further. The writer has repeatedly successfully wintered bees on three or four combs by confining them to one side of the hive (the side facing the sun) by means of a division board, or by putting two small stocks into one hive, a thin tightly fitting board and a separate entrance for each keeping them apart.

This crowding of bees on a limited number of combs has also the advantage of being a preventive of robbing. Robbing is generally started, in the first instance, by bees prowling round and finding honey in the unguarded outside combs of a colony. Becoming bolder, by degrees, the robbers will attack any poorly defended hive. Bees from other hives, attracted by the commotion, join in and share in the plunder. As colonies affected with Foul Brood are poor defenders of their home, such a colony, if one is in the apiary, usually falls a victim to the robbers and the robbers in turn develop disease in their hives.

In conclusion, the writer would point out that any combs removed from the hives should be at once secured from access by bee moths, by tiering the cases and securely covering the top and bottom of each stack. It is during the autumn that the wax or bee moth deposits its eggs on the combs, although the grubs do not appear till spring. Often the bee-keeper is unaware that the eggs are present when he carefully packs away his combs, after leaving them exposed to the moths for a short time.

VEGETABLE GARDEN AND FODDER CROPS ON THE GOVERNMENT EXPERIMENTAL FARM, CHELTENHAM.

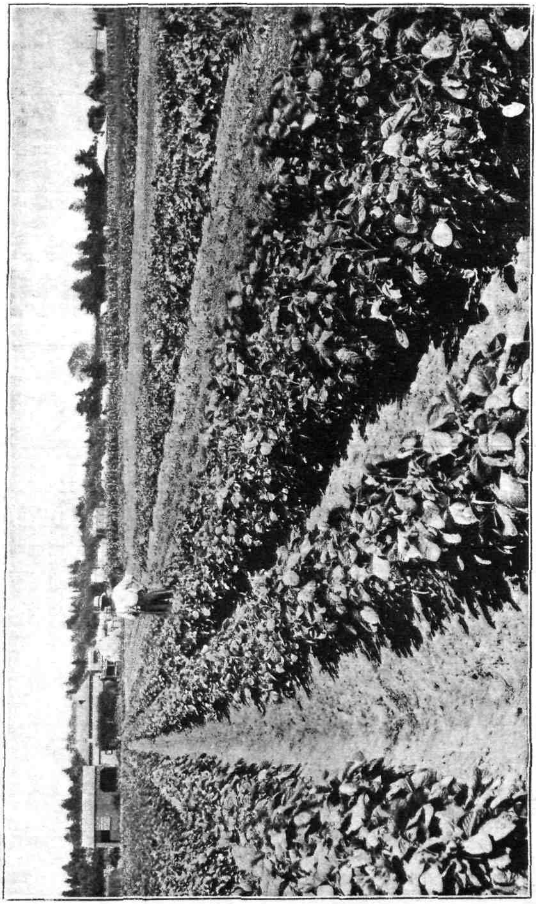
J. M. B. Connor, Agricultural Superintendent.

Three years ago the Department of Agriculture established an experimental vegetable garden on the farm of Mr. J. Wedd, situated near the Cheltenham railway station, and engaged the owner as manager under the direction of the Field Branch. Five acres of ground have been set apart and utilized for experimental plots in which new varieties of different kinds of vegetables are grown in season under the ordinary conditions of commercial market gardening, but with up-to-date methods of propagating and improved cultural operations and methods of manuring. Vegetables are now being grown on this farm under manurial conditions unheard of a few years ago. Stable manure has been, and is still, the most satisfactory fertilizer used by the market gardeners along the coast from Brighton to Mordialloc; but, as will be observed from the tabulated returns published below, artificial fertilizers have given marked returns in many instances. The analyses made of this particular soil, and of samples taken from other farms in close proximity to it, show that the amount of plant food contained in this class of soil would not be sufficient for the need of the plants for any length of time, being very deficient in phosphoric acid. The virgin land was ploughed 4 inches deep, disc harrowed and the rubbish burned off. It was then cross ploughed to a depth of 8 inches, disced, and cross harrowed. Stable manure, at the rate of 10 tons per acre, was applied, at a cost of £3 per acre, and the plots planted with potatoes, cabbages, &c. The second year's operations consisted of the planting of various crops of vegetables under manurial tests. These have been continued on the lines recorded in the statement showing the returns for last season.

The real value of this farm lies in its monetary returns as everything grown is marketed at a profit; a good deal of the success can be attributed to the thorough work and co-operation of the owner. One of the chief sources of pleasure, and profit, but which is conspicuous by its absence on most farms, is a vegetable garden. The growing of vegetables leads to better system of farming and a well tilled garden yields from ten to twenty times better returns when compared with general farm crops grown on the same area of land. Very few people fully realize the wonderful progress that has been made in the various branches of market gardening. No doubt the rapid progress made on this particular farm is due in no small measure to the thorough system of tillage, the conservation of soil moisture, and the encouragement of the growth of beneficial bacteria in the soil. Irrigation is not practised, and the results already attained certainly augur well for the future. There are pests that require continuous attention and care to combat. Without this the business of market gardening cannot be successfully carried on, and the wide-awake, aggressive, and progressive growers who wage war against pests are likely to grow more and better vegetables and make a financial success of the business. Such was clearly demonstrated this season on the sprayed potato plots on this farm.

The following particulars show the returns derived from the Farm for the year 1910:—

Crop.	Plot.	Date Planted.	Area.	Manure per Acre.	Date Harvested.	Plot Yield (actual).	Amount Realized for Produce of Plot.	Yield per Acre (estimated.)	Money Value per Acre (estimated.)
							£ s. d.		£ s. d.
Cabbages ..	A.	17th Jan.	1/30th acre ..	½ cwt. Sulphate of Ammonia, ½ cwt. Sulphate of Potash, 4 cwt. Bonedust ..	March and April	14 doz. ..	0 18 0	420 doz. ..	27 0 0
" ..	B.	"	" ..	3 cwt. Bonedust, 3 cwt. Superphosphate ..	March and April	13½ doz. ..	0 14 0	405 " ..	21 0 0
" ..	A.	26th Jan.	" ..	5 cwt. Bonedust, 1 cwt. Sulphate of Potash ..	May	15 " ..	0 11 3	450 " ..	16 17 6
" ..	B.	"	" ..	6 cwt. Blood and Bonedust ..	May	14 " ..	0 11 0	420 " ..	16 10 0
" ..	C.	"	" ..	5 cwt. Bonedust, 1 cwt. Ammonia ..	April and May ..	16 " ..	0 15 0	480 " ..	22 10 0
" ..	D.	"	" ..	No Manure	May and June ..	12 " ..	0 6 0	360 " ..	9 0 0
Swede Turnips	A.	20th Jan.	" ..	2 cwt. Superphosphate, 1 cwt. Sulphate of Potash ..	April	20 doz. bunches	1 5 0	600 doz. bunches	37 10 0
"	B.	"	" ..	2 cwt. Superphosphate, 1 cwt. Sulphate of Ammonia ..	April	19 "	1 8 6	570 "	42 15 0
"	C.	"	" ..	No Manure	May	16 "	0 16 0	480 "	24 0 0
Cauliflowers ..	A.	7th Feb. ..	" ..	5 cwt. Blood and Bonedust ..	June and July ..	14 doz. ..	0 14 0	420 doz. ..	21 0 0
" ..	B.	" ..	" ..	5 cwt. Blood and Bonedust, 1 cwt. Sulphate of Potash ..	June and July ..	15 " ..	0 17 6	450 " ..	26 5 0
Turnips ..	A.	9th Mar. ..	1/60th acre ..	3 cwt. Superphosphate, 1 cwt. Sulphate of Ammonia ..	May	16 doz. ..	0 8 0	960 doz. ..	24 0 0
" ..	B.	" ..	" ..	5 cwt. Superphosphate and Bonedust ..	May	15 " ..	0 7 0	900 " ..	21 0 0
" ..	C.	" ..	" ..	No Manure	May and June ..	12 "	0 4 0	720 " ..	12 0 0
" ..	D.	" ..	" ..	2 trucks Stable Manure	May	16 "	0 8 0	960 " ..	24 0 0
Onions ..	A.	1st July ..	1/30th acre ..	2 trucks Stable Manure	1st Feb. ..	8 cwt. ..	0 16 0	12 tons ..	24 0 0
" ..	B.	" ..	" ..	2 trucks Stable Manure, 2 cwt. Superphosphate and Bonedust ..	" ..	10cwt. 1 qr. ..	1 0 6	tons cwt. qrs. 15 7 2	30 15 0
" ..	C.	" ..	" ..	2 trucks Stable Manure, 2 cwt. Superphosphate and Bonedust, 1 cwt. Sulphate of Ammonia ..	" ..	11cwt. 2qrs. ..	1 3 0	17tons 5 cwts. ..	34 10 0
Potatoes (non-sprouted seed.)	A.	7th July ..	" ..	5 cwt. Superphosphate and Bonedust, 2 trucks Stable Manure	28th Nov. ..	4 cwt. 24 lbs... (Marketable potatoes)	1 9 0	t. c. qr. lbs. 6 6 1 20	43 10 0
Potatoes (sprouted seed.) ..	A.	10th Sept.	" ..	5 cwt. Superphosphate and Bonedust	22nd Dec. ..	t. qrs. lbs. 6 2 40	1 12 8	10 6 2 20	48 15 0
	B.	"	" ..	5 cwt. Superphosphate and Bonedust, 2 trucks Stable Manure	" ..	9 cwt. (marketable potatoes)	2 5 0	13 10 0 0	67 10 0
" ..	C.	"	" ..	4 cwt. Superphosphate and Bonedust, 1 cwt. Sulphate of Ammonia, 2 trucks Stable Manure	" ..	10 cwt. (marketable potatoes)	2 10 0	15 tons ..	75 0 0
" ..	D.	"	" ..	4 cwt. Superphosphate and Bonedust, 1 cwt. Sulphate of Potash, 2 trucks Stable Manure	" ..	cwt. qrs. lbs. 7 3 7 (marketable potatoes)	1 19 1	t. cwt. qr. lb. 11 14 1 14	58 12 6



GENERAL VIEW, GOVERNMENT EXPERIMENTAL FARM, CHELTENHAM.—SOYA BEANS IN FOREGROUND.

"TRAYING" SEED POTATOES.

One of the most interesting and successful experiments carried out this season was the "traying" or sprouting of seed potatoes under the direction of Mr. G. Seymour, Potato Expert, who is a strong advocate of the process as a preliminary to planting.* The results obtained are most encouraging and should appeal to the potato growers throughout the State. The system is destined to become generally adopted in the near future when growers recognise the benefits to be obtained in the heavier yields that result.

Planting for the main crop of potatoes generally takes place during the months of June and July. Frosts are very often the cause of great losses during the early spring through biting back the young potato plant. Mr. Seymour justly claims that the traying system overcomes a good deal of the danger, because the seed, when trayed, may be planted later in the season. This means that, instead of planting the tubers in June and July, the potatoes are kept in shallow trays, placed on racks in a shed, and not planted out until September. During the two months, the potatoes are allowed to grow or sprout in the trays and the eyes produce short, strong, and healthy shoots and not the weak spindly growth that one sees when the potatoes are stacked in bags or heaps. The growth is so strong under the traying system that, when the potatoes are planted, there is no check, with the result that there is not much difference in the time of digging operations. It also has the great advantage of giving the grower the opportunity of selecting sound seed at the time of planting and, further, the ground between the months of June and September can be utilized for other purposes.

The digging of the potato plots on the farm, which took place on 4th January, 1911, was witnessed and checked by a number of interested local vegetable gardeners who were convinced of the great advantages to be derived from the traying system and the use of artificial fertilizers. One of the features of the test was that the artificial manures, when used with stable manure, gave much higher returns than stable manure alone.

EXPERIMENTAL PLOTS.

The results, as tabulated below, from the experimental onion, turnip, cabbage, tomato, cucumber, pea, bean and other numerous vegetable plots clearly show the necessity of growing these improved varieties.

Besides vegetables, a small portion of the farm has been devoted to fodder growing with wonderfully good results, as will be seen from the illustrations. Varieties of Maize, Westernwolths Rye Grass, Toowoomba Canary Grass, Sulla, Lucerne, Earth Almonds, Pea Nuts and Soya Beans have been grown.

The plots have been inspected by farmers from all parts of the State and greatly admired. It is to be hoped that other persons interested in vegetable or fodder growing will take advantage of the opportunity to personally inspect this farm. The manager will be only too pleased to show them over and explain the methods in detail.

* *Potato Experiments at Cheltenham, 1910–11, page 171, March 1911, Journal.*

SOIL ANALYSES.

The following analyses of Cheltenham soils, and the comments on same, have been furnished by Mr. P. R. Scott, Chemist for Agriculture:—

Name.	Mark.	Kind of Soil.	Locality.	Parts per 100,000. Nitrogen.	Phosphoric Acid.	Potash.	Lime.	Chlorine.	Humus.	Acidity.
									per cent.	per cent.
J. Wedd ..	1A	Light sandy loam, 1 foot deep	Slight rise about 100 yards north of house, just outside garden	40	14	7	72	2	0·74	..
" ..	1B	Subsoil sandy, about 15 inches deep	" " "	17	6	5	48	2	..	..
" ..	1A2	Heavy sandy loam, about 1 foot deep	Close to north-west corner of garden, next Centre Dandenong-road in slight depression, about 100 yards from first sample	70	13	23	70	15	2·20	0·033
..	1B2	Subsoil, fine, sandy; about 1 foot deep	" " "	19	9	11	48	4	..	..
" ..	1A3	Loam, 1 foot deep	Slight depression against east fence, near where sugar beet *is planted*	154	14	54	154	16	2·65	..
" ..	1B3	Subsoil, sandy, about 9 inches deep	" " "	26	6	10	30	4	..	..
" ..	1C3	Under subsoil, stiff yellow clay, starting about 20 inches from surface	" " "	26	14	208	122	10	..	..
" ..	1A4	Rich loam, about 15 inches deep	Level land, close to south side of house	36	10	11	142	6	2·55	0·020
" ..	1B4	Subsoil, sandy, 1 foot taken, goes considerably deeper	" " "	10	10	5	64	6	..	..
G. McKnight ..	2A	Poor, sandy, about 1 foot deep	Slight rise about ½ mile east of of Nepean-road and about ½ mile south-east of J. Wedd's	95	12	10	72	9	2·01	0·040
" ..	2B	Subsoil, sandy, 1 foot taken, goes much deeper	" " "	28	6	10	24	18	..	..
G. S. Allnutt ..	3A	Stiff loam, about 9 inches deep	Low land, about 1½ miles east of J. Wedd's	60	12	17	64	18	2·09	0·026
" ..	3B	Subsoil, deep clay, 9 inches taken	" " "	53	20	42	88	19	..	..
" ..	3A2	Sandy loam, about 1 foot deep	Near Centre Dandenong-road, about 1½ miles of J. Wedd's, close to watercourse	116	17	21	104	4	1·70	0·014
" ..	3B2	Subsoil, sandy, about 1 foot deep	" " "	39	9	14	32	2	..	..
" ..	3C2	Under subsoil, clay about 6 inches taken	" " "	19	10	189	156	24	..	..
G. Rose ..	4A	Poor, sandy; about 6 inches deep	Poor, sandy rise, ½ mile north-east of J. Wedd's	86	14	12	62	2	1·75	0·020
" ..	4B	Subsoil, light sandy, 1 foot taken, goes considerably deeper	" " "	25	8	12	28	2	..	..
" ..	4A2	Light loam, about 1 foot deep	Low ground, about 200 yards south-west of the other sample taken	196	32	54	200	4	2·45	0·020
" ..	4B2	Subsoil, sandy, about 2 feet deep, 1 foot taken	" " "	17	14	1	50	4	..	..

The nitrogen content in 1A3, 3A2, 4A2, and 2A, may be considered as fair. The potash in the subsoils of 1A3, and 3A2, is also fair, and the lime content in 1A3, 1A4, 3A2, and 4A2 is satisfactory for soils of a sandy character. With these few exceptions, these soils show a general deficiency in plant foods when compared with a soil of good quality.

It will be noticed that the percentage of phosphoric acid in all of the soils is particularly low, and the analysis generally shows that the amount of plant food contained in the soils under review would not be sufficient for the needs of the plant for any length of time. On the other hand, there is no reason to suppose that, with good cultivation and the addition of fertilizers for the supply of plant foods, payable crops could not be

ONION PLOT.

grown. The soils would, no doubt, respond to treatment with artificial fertilizers, but systematic experiments in this direction would be necessary in order to ascertain the most effective manure.

A chemical analysis by means of an acid extraction only goes so far as to afford some information as to the permanent value of soils, but it is generally found that those showing a high percentage of plant foods are capable of yielding good crops, provided that extreme physical conditions do not interfere with the growth of the plant.

HARVESTED CROPS.

Besides the manurial tests set out above, the following vegetables were grown during the year:—

Potatoes.—One acre was planted with the following varieties, viz., Adirondack, Brown Hill Beauty, White Prolific, Sutton's Abundance,

Up-to-date, Green Mountain, and Carman No. 1; also a number of unnamed new varieties. The produce from the acre, 10 tons of marketable potatoes, sold for £39 1s. 6d.

Cabbages.—Half acre (All-head variety). Owing to the low prices ruling for cabbages last season the returns from the half acre were only £8 10s. Other years, when prices were higher, the same area would have returned between £17 and £20. Three-quarters of a lb. of cabbage or cauliflower seed, sown in a prepared bed, will produce sufficient for planting out an acre—about 7,000 plants planted in rows 2 ft. 6in. apart.

Cauliflowers.—Quarter acre (Eclipse variety) returned £6; planted the same as cabbages—at the rate of 7,000 plants per acre.

Onions.—Quarter acre (Early Brown Spanish) returned 2 tons 5 cwt. of marketable onions, which were sold for £4 10s. This is equivalent to

FORAGE PLOTS—LUCERNE, WESTERNWOLTHS RYE GRASS AND MAIZE.

a return of 9 tons per acre. It requires 2 lbs. of seed to transplant an acre of onions in rows 1 foot apart, or at the rate of 100,000 plants per acre.

Turnips.—One-eighth acre (White Stone variety) returned £2 15s., or equivalent to £22 per acre. When planted with a seed drill, the turnips are sown in rows 14 inches apart and require 2 lbs. of seed to sow an acre.

Carrots.—One-seventh acre (Sinclair's Champion field variety) yielded 5 tons 3 cwt. and realized £10 6s.; equivalent to a return of 36 tons of marketable carrots per acre, or £72 per acre. These were sown under the same conditions, as regards weight of seed per acre and distance apart in the rows, as the turnips and gave the highest returns of any vegetable grown during the season. 1-15th acre (James' Intermediate table variety) yielded 53 dozen bunches which realized £2 13s., or equivalent to £39 15s. per acre.

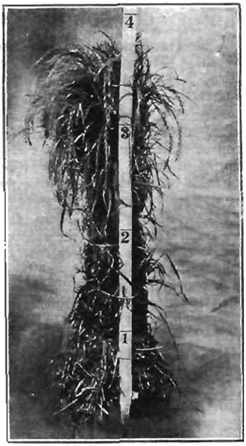
Swedes.—One-fifth acre (Champion Purple Top, table variety) returned 55 dozen bunches, which were sold for £3 19s. 6d., or equal to a return of £19 17s. 6d. per acre.

Tomatoes.—One-tenth acre (Large Red variety) yielded 20 cases and realized £2 10s., or at the rate of 200 cases per acre. ½ lb. tomato seed will produce enough plants to sow an acre, planting them out about 5 feet apart.

Maize.—Half acre has been devoted to the following varieties, viz.:—Hickory King, Goldmine, Blood Red, Early Yellow Dent, Yellow Moruya, Sydney Flat Red and Boone County Special. Early Yellow Dent came to maturity first and the balance were ready to feed in the following order, Goldmine, Sydney Flat Red and Hickory King; all of these gave good results.

GROWING CROPS.

There are also plots of the following growing on the farm at the present time, *i.e.*, on the manurial and variety plots—¼ acre each of cabbages and cauliflowers (Eclipse variety); ⅓ acre of soya beans; ¼ acre potatoes (Up-to-date variety), planted 28th December; ¼ acre potatoes (Sutton's Abundance), planted 25th January; ¼ acre Turks' caps; ¼ acre carrots (Sinclair's Champion); 1-6th acre of new varieties of tomatoes (Jack Rose and Atlantic Prize) as against Large Red variety; 1-5th acre of rhubarb (winter); 1-5th acre asparagus; 1-10th acre French beans; 1-10th acre Sydney variety of beans; 1-7th acre of Hunter's River lucerne; and plots of Westernwolths Rye Grass, Toowoomba Canary Grass, sulla, earth almonds and new varieties of lucerne.



WESTERNWOLTHS RYE GRASS.

The Westernwolths Rye Grass (*Lolium Westernwoldicum*), illustrated on this page, was recently imported from Holland and has done remarkably well where grown on sandy or clayey soils. It is a strong vigorous grower and makes rapid growth during the winter months. In appearance, the seed cannot be distinguished from Italian Rye Grass seed. It appears to thrive well over a wide range of soils, but the best results have been obtained on heavy loam, clay, or land somewhat damp. The Department has been so satisfied with the few trials already made of this grass that 112 bushels have just been imported direct from the grower, Hommo Ten Have, Scheemda, Holland, and the seed has been retailed to farmers in small lots at the cost price of 7s. 6d. per bushel.

In Holland, farmers sow it in close proximity to their farm buildings for the purpose of having a handy supply of green succulent forage for their dairy cows and working horses that are stall fed during the winter months. It is stated by the grower that, on good soils in Holland, when

top-dressed with nitrate of soda, it may be cut five or six times during the season. It is an annual, but, on account of its heavy seeding propensities, sheds enough seed yearly, if given a chance, to keep it going the following season. It far surpasses Italian rye in the rapidity of its growth and weight of herbage. I have grown it this season alongside several grasses, including perennial rye, Italian rye, cocksfoot, prairie and cow grass and it was out in ear and ready to cut before the others, under the same conditions, were half grown. I have no doubt that it will prove to be a valuable acquisition to our pasture fields.

TRARALGON DAIRY FARM COMPETITION.

J. S. McFadzean, Dairy Supervisor.

The Traralgon dairy farm competition was judged on the 6th and 7th March. There were five competitors, viz.:—Messrs. J. Drane, A. L. Cross, J. J. Dunbar, and G. Pentland, of Traralgon, and Mr. Moller, of Glengarry.

The first farm inspected was that of Mr. Drane, which contains 228 acres, subdivided into ten paddocks. Thirteen acres are carrying a fair crop of maize, and 17 acres were cropped for hay. There is a permanent supply of water pumped by windmill to the trough; but the system has not been extended further than the one paddock where the mill is, necessitating the travelling of the stock from the other grazing paddocks.

There are 50 cows in the dairy herd, 47 being in milk; and for the five months over which the competition extended, the cream returns for the herd averaged 4s. 6d. per cow per week. It was one of the rules of the competition that these returns be estimated from the butter factory cheques. Only one of the competitors was able to supply a record of these accounts when asked for at the time of inspection. The secretary of the butter factory, however, kindly furnished them; and they were subsequently checked with the owners' accounts by Mr. Christensen, the secretary of the Traralgon Agricultural Society, and came to hand in due time.

Mr. Drane makes a speciality of pure Ayrshire cattle. His bull is of very good quality, and there are some very fine looking dairy cows in the herd. The small number of 13 heifer calves on the farm does not go far towards testifying to the success of the year's breeding operations. There were, however, 23 reared; but 10 were sold in one line, the buyer taking his choice from the lot. It is seldom we find a breeder parting with half of his young stock in this way. As a rule, it is more profitable to sell off some of the older stock; for if bred on right lines, each year's heifers should show an improvement in quality over some of the older cattle.

The homesteading on this farm has recently undergone much alteration. There has been a change of site; and a new dwelling built, as well as a substantial milking shed of nine bails, with boiler-room and separator-room adjoining it on the lower end. At a little distance below the latter are the styes and calf paddock. There is no barn or other fodder-storage accommodation adjacent to the milking shed, the cows not being stall-fed. The maize grown is cut and fed to the stock in the grazing paddocks. When it is finished the cows are dried off; and dairying is suspended during the winter months.

The next farm visited, in order of inspection, was that of Mr. Cross, which contains 72 acres, in eight paddocks. Six acres of oats and 3 acres of maize were grown this year; and there is also about half an acre of lucerne on its first season. This was the only lucerne seen on these dairy farms, although the soil and locality seem highly suitable for growing this fodder.

Up to a little more than a year ago, Mr. Cross was in business in Traralgon, when he sold out and went into dairy farming. He acknowledged having no previous experience; and under the circumstances he has made a very good showing in the time. The whole of the improvements on the farm have been added since he purchased the land. The buildings are neat and well kept; though, for convenience of working, some of them might have been better arranged. The dairy is some distance from the milking shed and roadway, but is well situated as regards convenience to the dwelling, and also from a sanitary standpoint. The distance between the barn and milking shed will also necessitate some haulage of fodder when the cows are being hand-fed.

Twenty-one cows are kept, and the cream return from the factory averaged 3s. 4½d. per cow per week for the five months under consideration, viz.:—October to February, inclusive. The cows are crossbred stock, and the bull is an Ayrshire. Notwithstanding that there was plenty of grass and other fodder on the farm, the cows were in rather low condition. Being, as stated, new to the business, Mr. Cross was unaware of the necessity of providing some of the little extras that count for so much with dairy stock during the drier months of the year. The cows had recently commenced to chew bones, sticks, and other sundries. Such abnormal appetite can usually be corrected by providing them with cattle bone-meal and coarse salt; and condition can be improved almost at once by giving a little rich food, such as oil-cake, with a few handfuls of chaff daily. If the lucerne, green oats, and maize that were on hand had been made full use of, and the bone-meal also been supplied, the cows would have held up better in both their milk and condition. Mr. Cross had made the not unusual error of supposing that because there was an abundance of grass in the paddocks, the cows had all that they required. Though the paddocks looked green, the proportion of dry grass to the new growth was very large; and while dry stock would do well on it, there was not enough nourishment in it to sustain the milkers in condition. The calves on this farm showed an unusual proportion of males, only five heifers being dropped this season. The water supply by dam, well, and the Traralgon service pipes is good.

The third farm inspected was that of Mr. Dunbar. This is made up of 207 acres freehold, and 176 acres held on lease; and on this latter is the present farmsteading. There are 9 grazing and 6 cultivation paddocks; 26 acres were in hay this season, 4 acres are in maize, and there are 2 acres in mangolds. The latter is an exceptionally fine crop, growing on rich flat land adjacent to the creek, which provides permanent water for the stock throughout the grazing paddocks.

The milking shed is of 30 bails, well floored and clean, but improvement could be made in the shed by bricking the drains throughout. The barn is a long way from the milking shed, while the cream room and separator rooms are also further apart than is convenient. Some of the styes are badly situated, being in too close proximity to the milking shed and dairy.

The cows are a very fair class of crossbreds, showing Jersey, Ayrshire, and shorthorn blood; and there are a lot of good quality dairy cows amongst

them. The Ayrshire bull running with them is also of good dairy appearance. The young stock here—38 heifers in all—are an exceptionally fine lot. Most of them should make into good milkers; and, judging on appearances, Mr. Dunbar is making progress along this line.

Mr. Pentland's farm at Traralgon South was the next visited. There are 526 acres on this farm; but a large portion of it is rough country, carrying young stock. It is subdivided into 6 grazing and 10 cultivation paddocks. This season there were 25 acres sown for hay; 19 acres are in Japanese millet, but most of this had been grazed down at the time of inspection; 3 acres are in maize, and carrying an exceptionally heavy crop; and 1 acre of peas has been harvested for the use of the pigs and poultry. The water supply is from creek and well.

There is a well-built 20-bail milking shed, but the approaches are rather narrow. The milking is done with L.K.G. machines, which are doing satisfactory work. A large and well stocked barn adjoins the milking shed, and a silo is now under consideration. Some further improvements are also contemplated in connexion with the separator room and the transport of skim milk to the styes and calf paddock.

There are 73 cows in the milking herd, and 60 of these are at present in milk. The average return from the herd during the competition works out at 3s. 4d. per cow per week. On appearance this was the best dairy herd in the competition, although there was plenty of room for improvement. They were grades and crosses of Ayrshire and Jersey; and two Ayrshire bulls were with them. Of pure Jerseys, there are a few nice quality cows, a young bull, and several well bred heifers, from which the owner intends to increase his stock of this breed. In young cattle, there were 37 heifer calves and 31 two-and three-year-old heifers, many of which promise to turn out well for dairy work.

The fifth and last farm to be seen was that of Mr. Moller, of Glengarry, 9 miles out of Traralgon. On this there are 624 acres, subdivided into 14 paddocks; 25 acres were cultivated this season for hay and grain, and 18 acres are now carrying a good crop of maize. A 3-acre paddock of clover, sown last autumn, has made fine growth; and 2 acres of mangolds promise to be a fair crop

The cows are crossbreds, showing no special breeding; and an Ayrshire bull is used. The milking herd contains 89 cows, of which 70 are in milk; and the average factory return for the past five months has been 3s. 5d. per cow per week. While not in low condition, the cows might be improved in this respect, and there is room here for culling also. There are 33 heifer calves and 45 older heifers, several of which are to come in shortly and replace the poorer milkers Some improvements in the milking shed have not yet been completed, but it is kept tidy. In regard to the convenience and condition, the dairy on this farm was the best seen. The situation of the chaff shed could have been improved for convenience of stall-feeding. The yards are kept in fair order, the manure being carefully stored for use on the cultivation land

This was the only place where a record of the work of the farm and the dairy returns has been kept systematically. This does not, however, include the individual yield of the cows. None of the farmers have kept complete dairy returns, though most of them know a good deal about their best milkers, as they have tested them prior to competing in the dairy cow tests at the district shows. But the poorer cows have not been given the attention that would enable careful culling to be carried out; and, as a

consequence, every herd is carrying too large a percentage of inferior stock for best results.

With the one exception previously mentioned, the dairy work is continued throughout the year on these farms; and many of the cows on each had been in milk for some months prior to the commencement of the competition, which, in some measure, accounts for the comparatively low average returns obtained. It will be noted that the averages are estimated as from the total cows in the herds during the competition. If only the number of cows actually in milk each month were considered in this estimate, the returns would have been much larger all round, though the result of the competition would not be affected.

It will be seen that the milking standard of these herds leaves room for much improvement; and it would prove very profitable work to the owners to institute systematic culling on individual yields. Each owner has enough good cows to enable him to build up a first-class herd in a very few years. On the whole, the bulls kept were of a better dairy class than is generally met with; and if they are bred from as good dairy stock as their appearance indicates, there is no fault to be found on their side.

Reviewing the conditions of each place in regard to the final result of the competition:—

Mr. Pentland's strong points are his stock, construction of milking shed and barn, shelter and water supply.

Mr. Moller is best in fodder cultivation, shelter, dairy, young stock, and records.

Mr. Drane wins his points mainly on returns, uniformity of breed, and milking shed construction.

Mr. Dunbar keeps fairly forward in all sections, but his young stock was the best item.

As mentioned, Mr. Cross is practically a beginner. He is carrying more stock per acre than the rest, and is doing well in fodder cultivation. With good water supply, fair shelter, and neat buildings, his progress to date is very creditable.

The respective positions in the competition are:—

1. Mr. Pentland;
2. Mr. Moller;
3. Messrs. Drane and Dunbar (equal); and
4. Mr. Cross.

The points awarded are as follows:—

Section.	Maximum Points.	Competitors.				
		Pentland.	Moller.	Drane.	Dunbar.	Cross.
Best average return, 12 points per 1s. per week ..	100	40	41	54	45	40
Situation, construction, arrangement, and condition of yards and buildings	100	75	71	59	61	72
Farm Management—Pasture, cultivation, water, utensils, system, and records, utilization of manure	100	62	79	60	63	67
Stock—Quality and condition, and number of young stock	100	75	55	65	69	41
Totals	400	252	246	238	238	220

ALEXANDRA FODDER CROP COMPETITION.

J. M. B. Connor, Agricultural Superintendent.

The judging in connexion with the Alexandra Fodder Crop Competition took place on the 3rd and 4th March. Whilst delighted to see such magnificent crops of maize throughout this fertile district, I was disappointed to find only six competitors entered for the competition.

The growing of nutritious fodder for stock of all kinds, especially for the dairy herd, involves many difficult questions regarding the production of suitable forage crops which will yield per acre the greatest food value per unit of expenditure. The influence of various fodders upon the quality of the milk produced has, in recent years, been carefully studied by the Departmental experts and applied to farm practice. Not only has the number of useful forage crops increased, but they are now grown in well balanced mixtures or in rotative courses by many progressive farmers throughout the State. There is no doubt that the fodder competitions held in the dairying districts throughout the State are the means of bringing about improved methods of cultivation and greater success in modern farming generally. These and similar competitions must eventually help to set a standard in the various districts for other progressive farmers to follow Present-day progress in agriculture is regulated by the increase of scientific knowledge. Its intelligent application spells success.

The following results have been arrived at after carefully inspecting each competitor's crop, weighing sections, measuring heights, and taking into consideration the preparation of the land previous to sowing operations, cleanness of the crop, quantity of seed sown, and estimated yield per acre.

Points Awarded.

Section.	Maximum Points.	Competitors.					
		D. Kennedy, Thornton.	R. Rennie, Acheron.	J. Clark, Thornton.	Christie Bros., Thornton.	T. A. Robb, Thornton.	J. O'Rourke, Thornton.
System of cultivation and cleanness of crop	25	20	23	15	12	15	15
Care and selection and number of varieties sown	10	6	9	5	5	5	5
Quality of crop bulk of leaves and stems ..	25	21	23	18	20	18	18
Quantity of seed sown per acre ..	10	6	9	5	5	5	3
Yield per acre	1 point per ton per acre	52½	42⅓	43¾	36½	34	35
Total points	..	107½	106⅓	86¾	78½	77	76

First—D. Kennedy; second—R. Rennie; third—J. Clark.

The following remarks dealing with the various sections will indicate to the competitors wherein they gained or lost points.

1. *System of cultivation and cleanness of crop.*—In this section, Mr. Rennie's crop scored the highest number of points, for the reason that it was sown in drills 3 feet apart and kept free of weeds during the growing season by inter-tillage and the conservation of the soil moisture. At the time of inspection this crop was certainly the cleanest and best cared for. The headlands along the majority of the crops were overrun with thistles and deadly nightshade. I cannot understand farmers being so blind to their own interests as to allow such fertile country to become

infested with noxious weeds. When contrasted with the many dirty crops to be seen when driving along the main road, Mr. Rennie's crop is one of the finest object lessons in the district. The drilling of all forage crops sown for future use, and inter-tillage to keep down noxious weeds, is the only salvation for the ultimate cleaning of the infested lands throughout

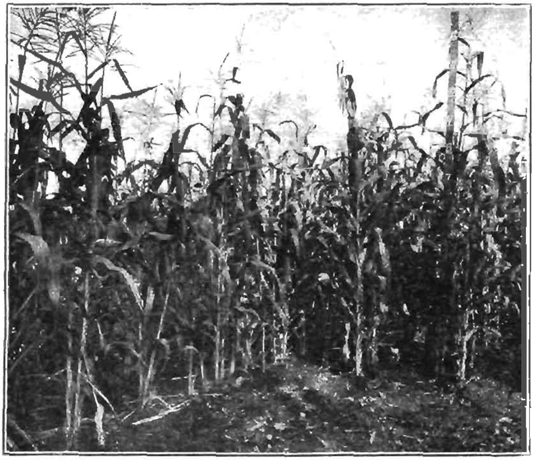
MR. D. KENNEDY'S MAIZE CROP (10 ACRES), THORNTON. FIRST PRIZE.
Yield per acre, 62¼ tons.

the district. As stated, Mr. Rennie's crop has been kept thoroughly clean by inter-tillage. When the present crop is taken off the land will be in good condition for putting down in lucerne which does so well in this district when sown under proper conditions.

2. *Care and selection and number of varieties sown.*—Very little attention had been given by the majority of the competitors. Mr. Rennie

again scored, having sown the well and favourably known varieties of Hickory King, Early Yellow Dent, and Sydney Flat Red, with the result that he is in a position to know, by practical experience, the most suitable variety to grow in the future for early and late sowing.

3. *Quality of crop, bulk of leaves and stems.*—The drilled crop of Mr. Rennie's gained points on account of the growth of foliage and uniform maturity of the cobs. This was very noticeable when the crop was compared with the broadcasted crops, and even with those sown in closer drills. The admittance of sunlight, made possible by the width



MR. R. RENNIE'S MAIZE CROP (5 ACRES), ACHERON. SECOND PRIZE.
Yield per acre, 42¼ tons.

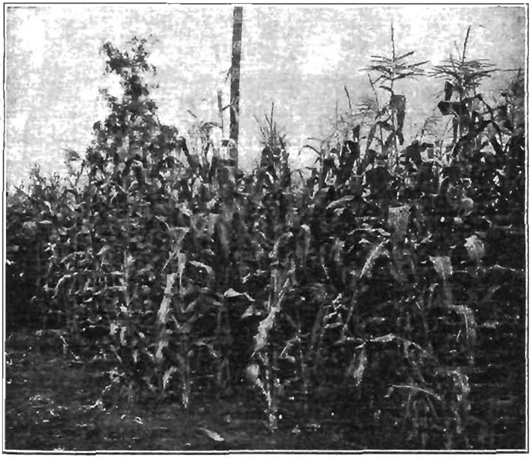
between the drills, appeared to have given body and sweetness to the luscious leaves and stems that were absent in the overcrowded and sour broadcasted crops. The cobs were more uniformly matured and more evenly fertilized.

4. *Quantity of seed sown per acre.*—As the points in this section indicate, Mr. Rennie again leads. His crop of Hickory King maize, sown at the rate of 15 lbs. per acre, was very uniform as regards growth and height. The quantity per acre sown by the other competitors ranged from 35 lbs. to 1½ bushels.

5. *Estimated yield per acre.*—In this section I had the pleasure of weighing some of the finest crops of maize, both as regards height of stems and bulk of leaves, that one could wish to handle. On the farm of Mr. Kennedy the highest portion of the crop measured 14 feet and the lowest portion 11½ feet, or an average height for the 10 acres, after taking

measurements in ten different places, of 13 feet. In order to arrive at something like an accurate weight, I selected numerous average portions of the respective crops, weighed a given area, and averaged the whole, with the result that Mr. Kennedy's crop returned an estimated total weight of 52¼ tons of green fodder per acre. What other fodder crop grown can favourably compare with such satisfactory returns?

In roughly estimating the commercial value of this crop, the estimated weight per acre and the nutritive composition have both to be taken into consideration. For instance, analysis shows green Hickory King maize,



MR. J. CLARK'S MAIZE CROP (8 ACRES), THORNTON. THIRD PRIZE.
Yield per acre, 43¾ tons.

when thoroughly matured, that is, when the kernels are in a glazed condition and before entering the ripening stage, to contain the following feeding value:—Protein 2.10 per cent., carbo-hydrates 8.37 per cent., fat 0.53 per cent. Compare this with bran, which shows, on analysis, protein 11.2 per cent., carbo-hydrates 42.2 per cent., and fat 2.5 per cent. On this basis, Mr. Kennedy's crop of 52¼ tons per acre would be equal in feeding value to 8.71 tons of bran.

The foregoing information is supplied for the purpose of showing competitors the value of maize grown under proper conditions and fed to stock with lucerne and other leguminous fodders in a well balanced ration.

The crop of lucerne inspected on the farm of Christie Bros. was very fine. It well illustrated the suitability of the district for the growing of this valuable fodder plant, a few acres of which should be cultivated on every farm.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, Principal, School of Horticulture, Burnley.

The Orchard.

Cultivation.

Cultivation work should be well on the way by this time. The ploughing should be advanced, so as to leave plenty of time for other orchard work. The autumn ploughing may be as rough as possible, taking care to plough *to* the trees, so that the drainage furrow is left between the rows.

Manuring.

It is just probable, where heavy crops have been carried, that a top dressing of stable manure will be required to add humus to the soil. A remarkably heavy crop of pears has been produced this year, and the trees will likely require a stimulant for next season. The fertility of the soil must be maintained; and, although stable and chemical manures as a general rule are of undoubted value as tree stimulants, well cultivated and thoroughly tilled land will always carry fair crops, and with far less manure than otherwise. Also, if the orchard land is well and thoroughly drained, cultivated, and subsoiled, any manures that are used will be far more beneficial to the trees. The more suitable conditions that are given to the trees, the better they can appreciate and assimilate their food.

Perhaps the most useful and valuable of manures is stable manure. It is of great use, not only as a manure and as an introducer of necessary bacteria into the soil, but its value in adding humus to the soil is incalculable. Organic matter, such as stable manure, introduced into the soil, quickly becomes humus; this greatly ameliorates and improves soil conditions. It is impossible to say what quantity of stable manure is necessary per acre; that alone can be determined by each circumstance. Orchards in different climates, and on various soils, will require differing quantities. A too liberal use of stable manure will be over-stimulating in most cases; while an excess beyond what is necessary for present use, will only be waste, as humus is readily lost from the soil, once it is in an available food form.

It has been pointed out in these notes previously, in September, 1910, that an improved physical soil condition is far more profitable to the fruit grower, than the continued use of manures. A tree will be far more productive if it is happy in its soil conditions; uncomfortable conditions will always result in unprosperous trees.

A dressing of lime, using about 4 or 5 cwt. per acre, is of great value in stiff or heavy orchard lands; and it may be given at this season. The lime, which must be fresh, should be distributed in small heaps between the trees, covered with a layer of soil, and allowed to remain for a few days before ploughing or harrowing in.

Pests.

The advice given last month for spraying should be followed, particularly where any oil emulsions or washes are to be used.

Orchards will benefit if an attack is now made upon the Codlin Moth. All hiding places, nooks and crannies, wherever the larvæ have hidden, should be thoroughly searched and cleaned out. The orchardist has far more time now to do this work, than he will have in the springtime.

GENERAL WORK.

Drainage systems should now be extended with as little loss of time as possible.

New planting areas should be prepared, and subsoiled or trenched wherever possible.

Vegetable Garden.

Weeds must be kept down in the vegetable garden. Weeds are generally free growing at this season; their growth is very insidious, and they will crowd out the young seedlings or plants in a very quick time. Hoeing and handweeding must be resorted to, preferably hoeing. The frequent use of the hoe in winter time is of much benefit in the vegetable garden. A varied assortment of crops is now being produced; and, if these can be kept growing, much better crops will result. The soil quickly stagnates in the winter, and the only way to prevent this is to keep the surface stirred. Thus, a double service is performed with the aid of the hoe.

The application of lime is a matter of great necessity at this season. In addition to amending unhealthy and unsuitable soil conditions, lime is particularly useful as an insecticide. It assists in destroying both eggs and insects in immense numbers, that would breed and live in the ground to do damage to all classes of vegetable crops. Therefore, wherever possible, the soil should receive an application of lime. The garden should as well be manured with stable manure, but not for some weeks after the lime application.

Cabbage and cauliflower plants may be planted out; and seeds of parsnips, carrots, onions, peas, and broad beans may be sown

Flower Garden.

The whole flower section should now be thoroughly dug over. All beds should be cleaned up, top dressed with manure, and well dug. The light rubbish, such as foliage, twiggy growths, weeds, etc., may all be dug in, and they will thus form a useful humic addition to the soil. These should never be wasted. Only the coarser and stouter growths should be carted away for burning, and then the ashes may be used as manure. No part, whatever, of garden rubbish or litter need be wasted. In one form or another it should be replaced in the soil.

May is a good month for establishing new gardens, and for planting out. All deciduous plants and shrubs may now be planted. It is not necessary to dig a deep hole for planting. A hole in which the roots of the plant can be comfortably arranged, without crowding or cramping, will be quite sufficient for the purpose.

Continue to sow seeds of hardy annuals, including sweet peas, although the main crop of sweet peas should be well above ground. Where there has been any overplanting, the young plants will readily stand transplanting, and this will greatly assist those that are to remain. Annuals should not be crowded in the beds. They require ample room for suitable development; and thus the seeds should be sown thinly, or the plants set out at a fair distance from each other.

All herbaceous perennials that have finished blooming may now be cut down. Included amongst these are phlox, delphiniums, etc. If these are to remain in their present situation for another season, it is always an advantage to raise them somewhat, by slightly lifting them with a fork,

so that too much water will not settle around the crowns; they may also be mulched with stable manure, or the manure may be forked into the soil around the crowns.

SUPPLEMENTARY LIST OF FRUIT TREES, ETC.,

GROWN AT

THE ROYAL HORTICULTURAL GARDENS AND SCHOOL OF HORTICULTURE, BURNLEY.

E. E. Pescott, Principal.

The revised list of fruit trees in the Burnley orchards was published in the *Journal* for June, 1910. It was compiled up to December, 1909, and at that time there were 1,554 varieties of fruits in cultivation.

Since that date 229 varieties have been added, and 5 have been removed from the list, bringing the total of fruits at present in cultivation up to 1,778.

Buds and grafts of the varieties on this list will not be available for distribution this season.

A new feature is introduced in this supplementary list, viz., where any fruit is known by more than one name, the standard name is given, and the synonym appears in brackets alongside.

The following names should be omitted from the previous list of apples, in which they were inadvertently inserted as separate varieties:—

Allan Bank Seedling. *Syn.* with Gloria Mundi.
Baltimore. " " "
Neverfail. *Syn.* with Margil.
Woodstock Pippin. *Syn.* with Blenheim Pippin.
Ohinemuri. *Syn.* with Munroe's Favourite.

Varieties of trees that have proved generally useful and fruitful are prefixed by an asterisk.

ALMONDS.

Burbank's Seedling
Herriott's Seedling

APPLES.

Albany Beauty
Albury Park Nonesuch
Baron Wolseley
Barry
*Benoni
*Blondin
Christmas Pearmain
Devonshire Redstreak
*Dougherty
Duke of Clarence
Egremont Russet
Empress Alexandra White
Fall Beauty
*Gloria Mundi (Baltimore; Allan Bank Seedling)
*Irish Peach
King's Acre Pippin
*King of Tompkin's County
Kirk's Admirable (Hollandbury)
Lady Carrington
Late Gravenstein
Lincolnshire Pearmain
Lincolnshire Triumph
*Lord Nelson (Kirke's Lord Nelson)
Minier's Dumpling
*Moss' Incomparable
Mrs. Phillimore
*Peasgood's Nonesuch
*Prince of the Pippins
Prizetaker
*Ribston Pippin (Glory of York)
Scarlet Summer Pearmain
*Shockley
Springdale
*Swaar
*Twenty Ounce
Whatmough's Orange Pippin
William's Fancy
Wolf's River
Wright's Perfection
Yorkshire Beauty
*Yapeen Seedling

APPLES—CRABS.

Dartmouth
Eliza Rathke
Halleana
Neidwetzkiana
Oblong
Pyrus communis
Pyrus communis Aurea
Pyrus floribunda
Pyrus spectabilis
Pyrus spectabilis fl. pl.

APRICOTS.

Acme of Shenshe
Alexis
*Belle de Toulouse
Bruchèt
Brugarta
Camden Superb
Early Golden
*Early Moorpark
Cooley
Harris
J. L. Budd

APRICOTS—*continued.*

Mrs. Hart
Newcastle Early
Noonday
Oullin's Early Improved
*Orange (Royal George)
Paviot
Peach
*Pineapple
*Precocé de Victoria
Riverside
Robin's Imperial
Rouge
*Royal
*Sardinian
*St. Ambrose
*Twyford Seedling

CHERRIES.

Bigarreau Noir de Guben
Bigarreau Noir de Schmidt
Precocé de Bopard

FIGS.

*Black Genoa (Negro d'España, Black Spanish)
Black Ischia
Black Marseillaise (Black Provence)
Black San Pedro
*Brown Turkey
*Brunswick (De St. Jean)
*Castle Kennedy
Dorée (Figue d'Or)
Gouraud Rouge
Jerusalem
Mouissouna
*White Ischia (Green Ischia)

LEMONS.

Villa Franca

LOQUATS.

Herd's Mammoth
Japan Mammoth

MANDARINS.

Citrus japonica (Kumquat)
*Emperor
*Thorny

MULBERRIES.

Downing's
Hicks' Everlasting

NECTARINES.

Early Rivers
Lees' Seedling

ORANGES.

*Mediterranean Sweet
*Navel
Oonshi
*Parramatta Seedling
*Seville
*Siletta
*St. Michael
*Valencia Late
*Washington Navel

PEACHES.

*Alexander's Early
*Arkansas Traveller
Ashburton
Bartlett
Beer's Smock
Belôt's Late
*Comet
*Crimson George
*Crown Jewel
*Dr. Phillips
Early Anne
*Early Crawford
*Early Rivers
*Early York
*Gladstone
Globe
*Hale's Early
*High's Early Canada
*Jones' Early Red
Lady in Gold
*Lady Palmerston
*Late Crawford
Lord Roberts
McDevitt's Late Cling
Orange Cling
Powell's Beauty
Princess May
*Pullar's Cling
Ripe in April
*Royal George
*Royal George Cling
Royal George Free
*Royal George Rivers
*Salwey
*Saunders
*Sea Eagle
*Susquehanna
The Brilliant
The Globe
Thomas Rivers
*Wadeson's Red
*Wilder
Wonderful

PEARS.

Beurré de Fonqueray
Beurré de Avalon
*Citron des Carmes
*Clapp's Favourite
Directeur Hardy
Duchesse de Afrique
Japanese Golden Russet
Laffer's Bergamot
Madame Baltet
Mayhew's Winter Bon Chrêtien
Old Colmar
President Barabe
Princess (Muscat Robert)
St. Swithin's

PERSIMMONS.

*Among
Gibio Shin
*Haycheya
Jubilee
Magari
*Kurokuma
Myodina
Nightingale's Seedless
Nitari
Oonshi
Sago Maru
*Seedless
Tanenachi
Williams' Seedless
Yeddo Ischia
Yellow
*Yemon
Zengi Maru

PLUMS.

Abundance (Botan)
Akarana
Bartlett
Ogan
Sharp's Early
Trenowin
Yellow Diamond

QUINCES.

Champion
Giant of Lescovaz
Missouri Mammoth
Van Dieman's

VINES.

*Almeria
Cape Metallica
*Cornichon Purple
Daria
Gouais
Liverdun
*Ohanez (Flame Tokay)
Rupestris du Lot
Santa Paula
Scuppernong, White
White Muscadine
B.R. 219A
101—14
3309

MISCELLANEOUS.

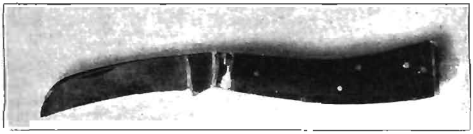
Balloon Berry
Lawton's Berry
Mammoth Berry
Phenomenal Berry
Wilson's Junior Berry
*Webb's Exhibition Filbe
*Webb's White Exhibit Filbert
*Webb's White Skinr Filbert
*Pomegranate
*La Fontaine Strawberry
*La Margaret Strawberry
*Melba Strawberry
*Sunbeam Strawberry
*East Indian Lime

PROPAGATION OF FRUIT TREES.

C. F. Cole, Inspector, Vegetation Diseases Acts.

To meet the demand for information concerning the propagation of the various edible fruits which flourish in the different parts of this State, a series of articles has been prepared by the writer and will appear in this and succeeding issues of the *Journal.*

Up to the time of my appointment under the Department of Agriculture, I devoted my attention principally to the propagation and cultivation

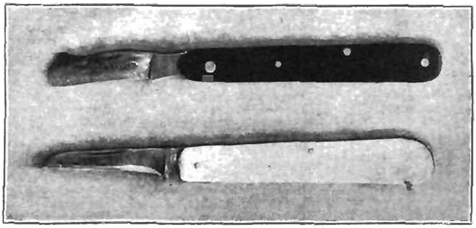


1. GRAFTING KNIFE.

of fruits and other products suitable to Victorian soils and climate. During this period, I tested most, if not all, of the propagation methods practised here. Therefore, I can confidently offer the following hints and methods with the hope that they will prove useful to those who have so far met with little success, owing to want of more practical knowledge; also to those not yet conversant with the methods practised for the raising of fruit trees upon sound lines.

Grafting and Budding.

A very brief explanation will show why grafting and budding are necessary. None of our choice varieties of fruits come true to the parent



2. BUDDING KNIVES.

from seed; and very few of those that can be raised from cuttings or layers are suitable. Therefore, having raised a new and choice variety from seed, or otherwise—and having only the one tree or bough—the question arises how to propagate and increase such a variety, at the same time keeping it true to the parent or sport, so that it may be cultivated extensively or otherwise, if necessary. To increase such a variety, the art of grafting and budding must be resorted to. It must also be utilized to render certain varieties more hardy, or less robust, by working upon stocks

of the same species and more suitable to soil conditions and climate; also to dwarf certain kinds of fruits by working upon stocks of slower growth; and, to overcome certain diseases that attack the roots of some varieties, by working upon other varieties immune from attack.

The theory of grafting and budding may be stated to be the power of union between the young tissues of the graft or bud and the growing wood. When the parts are placed together the ascending sap of the stock passes into and sustains life in the scion. The buds excited by this supply of sap begin to elaborate and send down woody matter which, passing through the newly granulated substance (callus), unites the scion firmly with the stock. Budding is performed while the stocks are in full foliage, or, in other words, fully vegetative. The union is swifter with the bud, than with the scion, *i.e.*, if the work is performed skilfully and under proper conditions.

The operations of the propagator are limited. A scion or bud from one tree will not, from the want of affinity, succeed upon all others—but only upon those to which it is allied. Although an evergreen, the loquat, which belongs to the rose family (*Rosaceæ*), does well and comes into bearing much earlier by working it upon the quince, which also belongs to the *Rosaceæ*. The pear is also included in the same order.

In France, which may well be termed the hub of horticulture, numerous methods of grafting are practised, those stocks which adapt themselves best to certain soil and other conditions being used. In floriculture the French use the common Margaret daisy (*Chrysanthemum frutescens*) as a stock for grafting the larger flowering varieties upon, *i.e.*, where both position and soil are dry. Many annuals are also successfully grafted. Grafting is far from being a modern method of propagation; we learn from early writers that it was known and practised by the ancient Greeks and Romans.

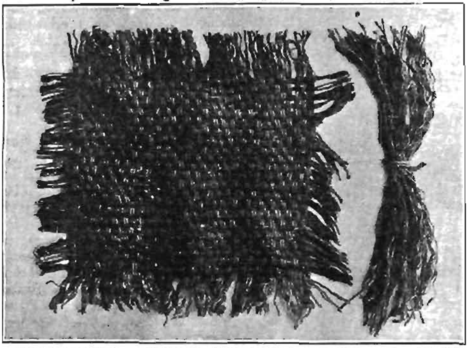
Improvement in Methods and Material.

It is the intention to deal with only those methods of grafting and budding which the writer considers to be the quickest, neatest, surest, and best, for producing a high standard of young fruit trees and stocks, that will not only be creditable to the producer or propagator, but a valued asset to the orchardist or planter. Nothing is more disappointing to find, after years of waiting and careful attention, that, through faulty propagation methods being adopted, one has to replant a fresh selection of trees just when the former lot ought to become remunerative. No person having any interest in fruit-growing should be ignorant of the best methods of propagating young fruit trees, or be unable to perform the operation of grafting and budding. Ignorance upon such matters is far too common in a fruit-producing State like ours.

During the past twenty years in Victoria there have been several new departures, to the advantage of the grower, regarding the class of stocks used for propagating upon. For instance, instead of the suckering Mussel plum, we have the La France "Myrobolan," a variety of cherry plum, and another variety called Mariana. Both are suckerless and easily propagated from cuttings; also, instead of the useless suckering pear stock, there is the selected non-suckering seedling.

There has also been a big improvement in the material used for binding the buds and grafts. Instead of calico, torn into narrow strips, or threads drawn from loosely woven bags, we now have raffia, obtained from the leaves of the Raffia Palm (*Raphia pedunculata*, Beauv.). It is a boon to propagators, being cheap, strong, and easy to tie.

To get the best results, raffia requires special treatment. Unplait the hank from the thin end and shake it out; then tie into smaller hanks, and cut the required length. The average length for binding buds is about 14 inches. After soaking it in water until softened, remove and twist to expel the moisture; and then beat against a post or something firm, when it will be ready for binding. Some propagators prefer it slightly moist,



3. SUJEE BAGGING. THREADS READY FOR BINDING—OLD METHOD.

and others dry. The advantage of using dry raffia is that, if tied properly, it is not so likely to slacken, whilst it will tighten upon becoming moist; if applied when moist, it is liable to slacken and become untied whilst drying.

SITE.

In choosing a site for the raising of young fruit trees see that it is well sheltered from rough winds by higher lands, or evergreen timber.

4. RAFFIA—UNTREATED AND TREATED, FOR BINDING.

If the position is exposed, serious damage is likely to be done to the growing buds in the spring and early summer by the strong winds, unless protected by an artificial breakwind, such as *Pinus insignis* or some other quickly growing tree, suitable to the locality.

The land, if possible, should have a slight fall, so as to allow it to be easily drained and worked. If too steep or abrupt, the soil is liable to

wash away and the working of the land becomes more difficult, thus increasing the cost of production.

If growing for sale, the nursery should be within reasonable distance of a railway station, so that there will be every facility for speedy despatch of stock to purchasers. Any district, provided it has a good average rainfall and moderate climatic conditions, may be chosen, and will be suitable for the propagation of most of our fruits in general cultivation. For the propagation of citrus fruits, mulberries, etc., the writer recommends the warmer districts of the State and where irrigation is available. Oranges and lemons can, however, be successfully propagated in the metropolitan district, where soil and position are suitable.

SOILS.

Although nursery stock may be, and is, raised upon many different kinds of soil, the most suitable and best all round is a good light deep

5. APRICOT TREES—SIX MONTHS FROM BUD.

loam with plenty of humus and a good nutritive clay subsoil. The advantage of selecting such a soil is that it is easily worked—an important item in the cost of production. If kept in a fine state of tilth, it is more suitable for the raising of seedlings in the beds, and produces trees with well matured growth and fine fibrous roots, which can be easily lifted without severe damage.

With proper treatment, and the judicious use of chemical manures, such soil will produce good nursery stock for an unlimited number of years. The writer has raised first class stock upon this class of soil which has been in use for thirty years. An illustration is given on this page, of apricots, six months from bud, worked upon planted out stocks growing in soil which has been in continuous use for that period. With soil like the deep crumbly red, it is necessary, after a few crops of young trees have been taken off, to break up virgin soil for replanting, *i.e.*, if

good results are to be obtained. Otherwise, the cost of continually renewing humus and the liberal use of chemical fertilizers will add considerably to the cost of production. A locality which should be avoided is one where there is but a few inches of soil overlying a cold "spewy" cement-like subsoil.

PREPARATION OF LAND.

If there are any trees to be grubbed upon the selected site, all roots should be followed and cut out not less than 12 inches below the surface. In filling up the holes, the clay or subsoil should be replaced first and the surface soil last. Great care should be exercised in seeing that all bark and roots are gathered up and burnt; as from these the deadly fungus disease, Root Rot (*Armillaria mellea*), if present, will spread to the roots of the young trees and cause considerable loss.

The ground should then be well ploughed about 6 or 8 inches in depth and left lying in fallow throughout the summer. In the meantime, the site should be fenced and made thoroughly rabbit proof; if not, a single rabbit or hare, or even a dog, may do many pounds' worth of damage in a single night amongst nursery stock. The most suitable fence is one where the posts are placed 18 feet apart with two droppers, three wires, and wire netting 4 feet wide, 6 inches of the latter to be placed in the ground.

In early autumn, if favourable, run a disc roller over the ground; and plough, with a subsoiler attached, to the depth of a foot, care being taken not to turn up any of the subsoil upon the surface. Then reduce to a fine state with a disc roller; failing this, use an ordinary roller and harrows. If the soil is retentive, undrained, or the district a wet one, a week or so before planting, plough into lands from 18 to 26 feet wide, capable of planting four to six rows of stocks. Care should be taken not to turn up the subsoil. This will allow 4 feet between the rows, a margin of 3 feet upon each side of the outside rows, and give an alley of 6 feet between the lands.

If the land is well pipe drained, it is not necessary to form into lands, but simply to plant the whole area in a succession of rows. The writer prefers the forming of lands under any conditions. The alleys between the lands should be kept ploughed and well worked; before the winter starts they should be ploughed out, leaving a fairly deep furrow up the centre to carry off all surplus water. If this early opening out is neglected, there is a big chance of the soil becoming water-logged from incessant rains and causing injury to the roots of the young stock. The planter will have to be guided by his soil and climate, as to the number of rows he plants to a land.

DRAINAGE.

Before the later ploughing in the autumn the land should be thoroughly pipe drained. The depth and distance apart of the drains will be controlled by the nature and depth of the subsoil. In impervious clays, *i.e.*, clays which the water cannot readily soak through, the pipes need only be placed deep enough to drain the surface soil, but will need to be more frequent than when draining land having a loose crumbly subsoil. Place the pipes deeper in this latter class of subsoil.

In draining land, the pipes should always be laid with the fall, not against. Care should be taken to see that the pipes are level and properly joined; a covering of straw or rush should be placed over the pipes before filling in.

With properly drained ground, the temperature of the soil is raised in winter, moisture conserved in the summer, and better root conditions and growth brought about. Drainage is a great necessity. The constant trampling over the ground in the winter and spring months, if wet, works the soil into a quagmiry state, which becomes almost unworkable, especially if the spring turns in dry, and the soil is heavy and retentive. Such conditions lessen the depth of sweet congenial soil.

When laying out the nursery, leave headlands wide enough to turn when ploughing or cultivating. If a large area, it is advantageous to have one running through the centre.

CULTIVATION.

Cultivation requires skilled labour—intelligent men used to the work. A slight knock to a growing bud or graft will often be the means of destroying a tree or forming an ill-shaped one. A careless hand, when hoeing or weeding among the young seedlings in the beds, may hoe, pull up, or injure them. It is only those engaged in the nursery business who know what damage can be done by the unskilled or careless hand. After the first autumn rains, the soil should be kept continually stirred

6. HORSE CULTIVATION.

with the cultivator and hoe, to destroy the germinating seeds of noxious weeds which foul the stocks and overrun the nursery, if neglected. It is far easier to destroy weeds in the germinating or young stage, than when they are allowed to grow and stool out. It is the autumn weeds which give trouble in the spring, if allowed to grow, and make a lot of extra work at one of the busiest and most important times in a nursery.

Care should be exercised, when hoeing along the stocks, that the sides of the hoe blade do not strike and bruise the bark. Deep hoeing should be avoided, or the surface feeding roots will be interfered with. If the stocks or young trees have become foul with weeds, skim them away with a sharp spade or shovel down one side and close to the stocks, care being taken not to strike or cut the latter, and back the other. Turn the skimmed

weeds into the middle of the rows, and weed out any between the stocks. The middle of the rows should now be dug through, deep enough to cover the turned in weeds. If, from the time of planting, the soil is kept well stirred to the depth of 3 or 4 inches and the hoe kept going along the rows, there will be no necessity for spring digging.

The cost of production can be greatly minimised and the work accelerated by the use of horse labour. A man with a quiet horse and a Planet Junior, or similar cultivator, with a 26-inch swingletree, will cover some acres of nursery stock in a day. This will keep down the weeds, bring the soil to a fine state of tilth, conserve moisture and better the conditions of the soil. The horse should be muzzled with a piece of wire, or other netting, if partial to the foliage of young trees.

A very poor method of cultivating among nursery stock, and practised at times, is chipping, *i.e.*, in the late spring, when the ground has

7. "MARIANA" PLUM STOCKS FROM ROOTED CUTTINGS.

set too hard for digging (a condition brought about through careless management) the weeds are chopped up and forked off between the rows. After the first fall of rain, the scarifier is brought into use, scratching the surface of the soil to the depth of an inch or two. Stiff soils, especially, if treated in such a manner become impervious, compact, and impoverished. The careless and slovenly cultivator is rarely blessed with success.

As some readers may be somewhat pessimistic regarding horse labour amongst nursery stock, the writer's advice is to give it an honest trial. Unless the horse is quiet and trustworthy, it will be necessary to have it led through the rows of young trees. With loose soils which easily wash, and where the position is an abrupt one, possibly horse labour would not be an advantage.

From the time of planting out the stocks permanently for working upon, it is generally three to five years before the land is cleared of young trees and ready for ploughing again. Before replanting such land, it should be well worked and treated the same as virgin soil and allowed to remain fallow during the summer months.

A better plan is to dig up any young trees early in May, strip off the foliage and heel in a trench until wanted for sale or planting out. Then prepare the soil and sow a crop of peas or other suitable green crop right away. If a leguminous crop, such as peas, roll down and turn in when in bloom, using a disc colter upon the plough. Roll any green manurial crop before turning in. Harrow lightly and let fallow. Plough again in the early autumn and give a final ploughing a week or so before planting. A heavy rank crop should be grown for green manuring. Always break up the subsoil afresh before replanting land that has carried a crop.

If the land is required for replanting the *same* season, and such land is deficient in humus, plough and subsoil immediately it is cleared of young trees, letting it remain fallow until a week or so before planting. It should then be harrowed, given a good dressing of stable manure and ploughed in. Harrow down to a fine state of tilth a day or so before planting. Apply bonedust when planting.

If replanting a soil rich in humus, plough well and use chemical manure, bonedust preferred, when planting. The reader will gather from this, that not being able to remove any young trees until the month of May, there is no chance to sow a green crop earlier, or to renew the soil by other means to better advantage for replanting the same season.

The following are, roughly, the indications of the want of humus in soils. With heavy soils they are cloddy, greasy, and sticky; with sandy or light, too loose, letting the water percolate through too readily. Deep cultivation and green manuring should be practised. By deep cultivation, a greater capacity for conserving moisture is obtained; also a greater supply of available plant food is formed by the mutual action of air and moisture. Green manuring is the cheapest method of renewing humus to, and improving, soils.

The different agencies which cause the turned-in plants to decay and set up chemical changes in the soil turn the insoluble or dormant parts into active or soluble plant-food. If the cultivator has stable manure or sweet-decayed vegetable matter on hand, cart it upon the land and place it in heaps. After the first rains in early autumn it should be spread and ploughed in. If there are any patches of clayey soil, give them the heaviest dressing. When re-ploughing any old formed lands, plough out and leave the last furrow down the centre, the final ploughing being back towards this centre furrow, thus re-forming the land ready for planting again.

When lifting young trees in the nursery, no holes should be allowed to remain open; fill in at once.

(*To be continued.*)

THE WINE INDUSTRY IN SOUTHERN FRANCE.

DEPARTMENT OF HÉRAULT.

(*Continued from page 242.*)

F. de Castella, Government Viticulturist.

VINEYARD MANURING.

In the last few articles of this series, attention has been directed to some of the causes which contribute to the enormous yields of Hérault vineyards.* We have seen that heavy bearing varieties are very generally planted; that the preliminary preparation of the soil is carried out to a considerable depth; that its annual cultivation is very thorough; and, lastly, that the training and, more particularly, the summer pruning are such as will best promote a high degree of fertility and its continuance during future seasons.

All these factors contribute to the high yields obtained, but none of them could exert its full influence—more especially, could not do so continuously—were it not for the copious manuring which is now invariably the rule.

According to Foex†—

> Abundant manuring with very active fertilizers is one of the characteristic features of Languedoc viticulture. The most divers substances are used: farmyard manure, sheep droppings, town sweepings, woollen rags, oil cake, reeds (*Arundo phragmites*), marc, chemical and commercial manures; and in a general way everything which can supply the vine with nitrogen, phosphoric acid, and potash. It is, thanks to their use, that growers manage to maintain the high fertility of the vineyards, which would soon decline if one did not replace the equivalent of what is removed in the shape of the grape crop.

It follows that, in manuring, perhaps even more than in any of the other branches we have considered, Hérault viticulture presents an object lesson of the greatest value to us in Victoria. A satisfactory change has taken place of recent years in the views of Australian agriculturists as regards manuring; a change in which viticulture has shared. Scarcely any one now states, as was frequently done a few years ago, that vines do not require manure. Its need is now very generally recognised, though its application is not yet as general as could be desired. It is chiefly as regards the quantity to apply that our growers are in want of education. The trifling additions of superphosphate which have an almost magical effect on our cereal crops and which have revolutionized Australian wheat growing, cannot possibly lead to anything like similar increases in vine yields. The root systems of the two plants are too fundamentally different. In the case of a deep rooting plant, such as the vine, it is only by far heavier applications, made some considerable time before results are looked for, that a marked improvement in yield can be brought about.

In southern France, vineyard manuring has been practised since the earliest times, but it is only of comparatively recent years that very heavy applications have become general. The modern practice is one of the consequences of the Phylloxera crisis, and may be said to date from the reconstitution of the vineyards on resistant stocks.

* As previously pointed out (*Journal* Vol. VIII., p. 72), yields of 3,000 gallons per acre are not uncommon. The region is remarkable as being that of the heaviest bearing vineyards in the world.

† G. Foex, *Cours Complet de Viticulture*, p. 620.

It is very generally recognised that grafted vines require more manure than ungrafted ones. This is largely owing to their greater fruitfulness. Taking more out of the soil, they necessarily hasten the day when restitution must be made in order to maintain yields. There is also another reason. The heavy sacrifices entailed by reconstitution have caused vineyard owners to take advantage of every device which science or art could suggest, in order to increase yields. It is in the increased quantity of manure employed, that we find the greatest change from older methods.

In pre-phylloxera days, the usual rule in well kept vineyards was to apply 22,000 kilos of farmyard manure per hectare, every third year (about 9 tons per acre). This would be equivalent to a yearly addition of 33½ lbs. potash and soda, 26½ lbs. nitrogen and 13¼ lbs. phosphoric acid. These figures were given by H. Marès* in 1862. At that time, there were authorities who questioned whether the manuring of vines was fully repaid by the increase in yield. To one of these, M. Cazalis-Allut, M. Marès replied—

> That practical examples are hard to find, since they should cover periods of at least twenty to thirty years, but that practical men, who seek everywhere for manure with so much care, and pay such high prices for it, have solved the question in the affirmative.

At the present day in southern France no one questions the efficacy of manure and it is used far more abundantly than it was in the sixties of last century.

MANURE FORMULÆ.

As might be expected, opinions vary greatly and, though every one manures, the substances employed, and their relative proportions, vary considerably. In a general way, farmyard manure is still applied much as it was in pre-phylloxera times, and is very largely supplemented by artificial manures. The quantity of farmyard manure varies from 8 to 12 tons per acre every second or third year. The large increase in the use of chemical and other concentrated fertilizers is the most striking modern development in connexion with vineyard manuring in Hérault; it is the logical outcome of the recognition of the high efficiency of these substances, after long years of application on a steadily increasing scale. It has also been forced on the growers by the insufficiency of the supplies of ordinary farmyard manure. In a region where viticulture preponderates to such an extent as it now does in Hérault, the forms of agriculture which lead to its extensive production are only developed to a small extent. Supplies of farmyard manure were barely sufficient forty years ago, when the vine did not predominate as it now does, and when production was not forced to anything like the present extent. Now-a-days, the quantities of farmyard manure are hoplessly inadequate and commercial fertilizers have thus become the basis of modern manuring.

In a recent article, Professor L. Degrully gives the following formulæ for different descriptions of soils. He points out that they must not be considered to be rigorously fixed and unalterable; that growers—

> may combine any other formulæ which may suit them; if they prefer to employ other nitrogenous organic manures than oil cake, which has been taken as an example, it will be easy to carry out the simple calculations necessary in order to remain within normal limits.

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* H. Marès, in *Livre de la Ferme*, Vol. I., p. 224. Foex gives the composition of farmyard manure employed in Hérault as—Nitrogen, ·4 to ·5 per cent.; phosphoric acid, ·7 to ·8 per cent.; and potash, ·4 to ·5 per cent.; on this basis, the annual additions would be potash, 24½ to 31 lbs.; nitrogen, 24½ to 31 lbs.; and phosphoric acid, 43 to 49½ lbs.

He distinguishes two categories, viz., dry soils with *extense** culture (culture *extensive*), and rich soils to which intense culture is applied. He points out that it would be a faulty operation to apply to vineyards situated in *garrigues*† or dry hillsides the same doses of manure as to vines in the plain, in the hope of seeing them produce luxuriant crops—it would be a similar case to the frog which wished to puff itself out to the size of an ox. It is necessary to endeavour to proportion the dose of manure to the "productive capabilities" of the soil; capabilities which depend on its depth, on its moisture (*fraicheur*), and on its intrinsic richness.

The heavy applications he recommends are to be made annually.

	per acre.	
	For dry land or extense culture.	For moister land or intense culture.
1. Light to medium limy soil.		
Oil cake (extracted with bi-sulphide of carbon), 6 per cent. of nitrogen ...	lbs. 630 to 720	... lbs. 1,080 to 1,260
Superphosphate, 15 per cent.	270 to 360	... 450 to 540
Sulphate of potash	90 to 135	... 135 to 180
Plaster (gypsum)	180 to 270	... 270 to 450
Approximate cost per acre‡	£2 6s. 2d. to £2 16s. 4d.	£3 10s. 5d. to £4 12s. 11d.
2. Clay lime soil.		
Oil cake (as above)	315 to 360	.. 540 to 630
Sulphate of ammonia	90 to 135	.. 180 to 225
Superphosphate, 15 per cent.	270 to 360	... 450 to 540
Sulphate of potash	72 to 90	... 135 to 180
Gypsum	180 to 270	.. 270 to 360
Approximate cost per acre	£1 19s. 3d. to £2 10s. 6d.	£3 10s. 5d. to £4 6s. 9d.
3. Sand clay soils (free) containing less than 2 per cent. of carbonate of lime.		
Nitrate of lime (or nitrate of soda) ...	270 to 360	... 450 to 540
Superphosphate, 15 per cent.	270 to 360	... 450 to 540
Sulphate of potash	*72 to 90*	... *135 to 180*
Gypsum	270 to 360	... 360 to 450
Approximate cost per acre	£1 17s. 6d. to £2 6s. 6d.	£3 0s. 3d. to £3 13s. 8d.
4. Clay soils (not limy.)		
Nitrate of lime (or nitrate of soda) ...	270 to 360	.. 450 to 540
Basic slag (Thomas' phosphate) ..	540 to 720	... 720 to 1,080
Sulphate of potash	72 to 90	... 90 to 135
Gypsum	360 to 450	... 360 to 450
Approximate cost per acre	£3 1s. 8d. to £3 8s. 9d.	£3 2s. 2d. to £4 1s. 7d.

The above formulæ are drawn up on the basis that—

If we exclude exceptional situations, the worst soils and those which may be classed as without equal, we can admit that the quantities of fertilizing elements to return per acre (reduced to) and per year are as follows :—

Nitrogen, from 36 to 72 lbs.
Phosphoric acid, from 36 to 81 lbs.
Potash, from 36 to 90 lbs.

Professor Lagatu, also of the Montpellier School, has drawn up a very popular wall sheet, in which he gives twelve different formulæ; a heavy and a very heavy, for six different soils, viz., light, heavy, and free; and for each he considers the case of it being limy or lime free.

* The French word *extensive* has a different meaning to the same word in English, and is used, especially in this connexion, as being the contrary of *intensive*. It may be translated into English by the word "extense" if such an innovation be permissible.

† A special form of hillside land with fissured limestone subsoil.

‡ The prices are worked out according to latest French price lists. In Australia the cost would be considerably higher.

The whole table cannot be here reproduced, but the formula recommended for a non-calcareous, free soil, will serve as an example. The quantities are for one acre (reduced to)—

Very heavy manuring.

	lbs.	lbs.			lbs.	Price.
Nitrogen ..	... 71.1	19.8	Dessicated blood	11 per cent.	... 180	... 14 10½
		37.8	Roasted horn shavings	14 per cent.	... 270	... 29 1
		13.5	Nitrate of soda	15 per cent.	. 90	... 8 1
		36	Carbonate of potash	50 per cent.	... 72	... 14 10½
Phosphoric acid	... 108	108	Basic slag ..	15 per cent.	.. 720	... 14 10½
Gypsum ...	...	...	... ...	..	... 900	... 3 3
						£4 5 0½

Heavy manuring.

	lbs.	lbs.			lbs.	Price.
Nitrogen ...	... 46.8	9.9	Dessicated blood	11 per cent.	... 90	... 7 5¼
		18.9	Roasted horn shavings	14 per cent.	... 135	... 14 6½
		18	Nitrate of soda	15 per cent.	... 117	... 10 7
Potash ...	... 27	27	Sulphate of potash	50 per cent.	... 54	... 5 2
Phosphoric acid	... 67.5	67.5	Basic slag ...	15 per cent.	... 450	... 9 4½
Gypsum ...	...	...	... ...	...	... 720	... 2 7
						£2 9 8½

Professor Lagatu explains that the above are annual applications, but that they may be advantageously replaced every third year by farmyard manure, either alone (limy land) or accompanied by basic slag (non-calcareous soil).

Thanks to the courtesy of the management, I was supplied with some interesting figures as to the quantities and nature of the manures applied to the very large vineyards owned by the *Compagnie des Salins du Midi*, a powerful company whose financial position permits it to employ the best scientific and practical men obtainable.

The vineyards owned by the company cover an area of several thousand acres; they are planted with ungrafted viniferas, the soil being of so sandy a nature as to insure absolute protection from phylloxera. During the 1906 season four different forms of manure were applied, viz., *Engrais animalisés*, a concentrated commercial manure made from animal refuse; fish guano (artificial); farmyard manure; and sheep droppings. The following table shows the chemical composition, quantity applied per acre, &c., for each of these—

—	Chemical Composition.			Quantity per Vine.	Quantity per Acre.	Total Cost per Acre, including Application.	Ratio of Cost Price to Total Cost.	Number of Acres Treated.
	Nitrogen.	Phosphoric Acid.	Potash.					
	%	%	%	Gramms.	lbs.	s. d.		
Engrais Animalisés ..	4·75	1·75	1·75	300	1,190	44 3	[illegible]	1,131¼
Fish Guano	3·75	8·0	2·5	300	1,199	58 5	[illegible]	766¼
Farmyard Manure ..	0·5	0 3*	0·5*	4,500	17,908	119 4	[illegible]	76
Sheep Droppings ..	1·75	..	...	600 (21 litres)	2,398	49 11	[illegible]	105¼

* Probable percentage.

At the large vineyard of Villeroy (864 acres) belonging to the same company, which has, in a single vintage, yielded over a million gallons of wine, the usual practice in previous years was to apply oil cake (containing 7 per cent. of nitrogen and about half as much phosphoric acid) at the rate of 18 cwt. per acre, per year. The market value of this oil cake is about £5 per ton, which would bring the cost of this dressing to £4 per acre. The results of such heavy manuring on vineyards planted in almost pure coastal sand, proves conclusively the extent to which vine yields can be increased by the use of manures.

Requirements of the Vine.

Manuring must replace, in the soil, the annual removals of plant food. It is therefore necessary that these should be accurately calculated. Muntz's investigations* on the requirements of the vine show, in a striking manner, the influence of climate. The warmer this is, the more complete is the utilization of fertilizing substances, so that for an equal yield, the vineyards of cold, northern climates demand heavier applications of manure than those of the warm south.

On the basis of M. Muntz's investigations, the following would be the amount of each important plant food element brought into play for the production of one hectolitre (22 gallons) of wine. The quantities are in kilogrammes (2.2 lbs.)†—

	Nitrogen.	Phosphoric Acid.	Potash.
Midi	.480	.118	.423
Medoc (claret)	1.485	.496	2.065
St. Emilion (claret)	1.349	.361	1.562
Burgundy	1.020	.295	1.025
Beaujolais	1.014	.334	1.214
Chablis	1.080	.200	.900
Champagne	1.690	.410	1.810

The difference between the figures for the Midi (warm southern France) and those for all the other districts is very striking. Champagne, the coldest of all, is also the most exacting. It is worthy of note that, with the exception of the Midi, all the above districts yield high class wines. It is, in fact, generally recognised that wines of high quality take rather more out of the soil than *vin ordinaire* does.

The greater efficacy of manuring in warm climates is a fortunate provision of nature, so far as the heavy bearing Hérault is concerned, and one which should prove consoling to us. The climate of northern Victoria, being even warmer than that of southern France, we may not unreasonably hope to very largely increase our grape yields by less costly applications of manure than those described above.

Which is the Dominant Manure Element?

This question has given rise to much discussion within recent years. For a long time, it was held that heavy applications of nitrogen were of greatest use for the purpose of forcing production, and it will be seen from the figures quoted above that nitrogen, the most expensive plant food element, is applied on a very lavish scale,‡ although, as we have seen, potash is removed in greater quantity. It is, however, more abundant than the others in the majority of soils, and portions of the non-assimilable reserves of this element are no doubt released by the gypsum which is

* Muntz. *Les Vignes. Etude experimentale sur leur culture et leur exploitation*, 1895.

† G. Chappaz in *Progres Agricole et Viticole*. 18 October, 1908.

‡ This is in direct contradiction to the results of all cereal manure experiments conducted in northern Victoria. Nitrogenous manures have led to little appreciable increase in wheat yields.

invariably an important constitutent in all recent French manure formulæ. Latterly, much more attention has been devoted to phosphoric acid than previously. Though it is removed from the soil in very much smaller quantities than either of the other elements, it appears to have a far greater importance than these small removals would lead one to anticipate. Phosphoric acid gives tone to vegetation generally, and has a most happy influence on the blossoming of the vine, the critical stage at which mishaps are frequently encountered, with disastrous results to the following vintage.

Phosphoric acid also appears to have an important influence on the quality of the wine. It is removed in greater quantity (in the wine) from high class vineyards. It is now generally recognised in France that, whereas nitrogen and potash must be returned at the same rate as they are removed by crop, prunings, &c., phosphoric acid can be profitably added in greater quantities. The two former substances appear to be readily absorbed by the vine, the latter only with difficulty; at least such is the ingenious explanation of Coste-Floret, one of the strongest advocates of heavy phosphatic manuring.

Basic slag (Thomas Phosphate) is generally preferred to superphosphate in all except limy soils, a point of interest to us, seeing that so many of our soils are poor in lime.

The importance now attached to phosphoric acid in France is of interest to Australians, our soils being poorer in that element than French soils.

No element can really be looked upon as a "dominant" one so far as manuring is concerned; the deficiency of any single one will limit the usefulness of the others just as a slow ship would retard the speed of a whole fleet of which it formed part.

Importance of Organic Matter.

Organic forms of nitrogen are held in high esteem, especially for soils in which the natural humic contents are low. The thorough tillage of the ground, previously described (*Journal*, vol. IX., p. 201) must inevitably lead to considerable annual loss of humus during the warm dry summers usually experienced.

Climatic conditions are not favourable to green manuring, without undue interference with usual cultural operations, hence this means of replenishing the depleted humic contents of the soil is but little practised.

Farmyard manure and other organic fertilizers are thus the only sources of it available. The supply of the former not being equal to requirements the latter are in great demand. The most varied substances are in use. Desiccated blood and animal refuse; artificial guano, chiefly made from fish; woollen rags; horn turnings and débris (preferably roasted), &c. Vegetable substances of various kinds are also largely used, among which may be enumerated the following:—Oil Cake; Seaweed, plentiful on the Mediterranean coast and which contains (fresh) up to .55 per cent. of nitrogen; Reeds (*Arundo phragmites*) .43 per cent. nitrogen; Branches of scrubby plants which grow on waste rocky land, such as Box, Cistus, &c. These are roughly chaffed before being ploughed in. Chaffed Box has a high value; it contains 1.17 per cent. nitrogen as well as much phosphoric acid and potash.

Marc (pressed grape skins) contains, on an average, 1.71 per cent. nitrogen and .5 per cent. potash; it is also used as vine manure, though rather more generally as fodder, its value as such being considerable.

Of this varied list, which is by no means exhaustive, oil cake is perhaps the most interesting substance. Though it is one with which we are quite unfamiliar from a manure standpoint here, it is employed to an enormous extent in southern France.

The neighbouring town of Marseille may be said to be the oil mill of France. It is the head-quarters of the oil extracting and soap making industries of the country and imports enormous quantities of oil containing seeds, the by-products from which are an important source of nitrogen and organic matter, for the agriculture of the neighbouring country. After treatment by ordinary pressure the last traces of oil are removed by extraction with bi-sulphide of carbon. The oil cake thus treated is known in French as *Tourteaux sulfurés.* It has the advantage of decomposing more rapidly than greasy cake, whilst its manure value is slightly higher.

Foex gives the percentage of nitrogen and phosphoric acid of several kinds of oil cake as follows:—

	Nitrogen.	Phosphoric acid.
Colza (Europe)	4.92	2.83
Castor oil (crude)	3.67	1.62
Castor oil (skinned)	7.42	2.26
Sesame (black)	6.34	2.03

This oil cake is employed at the rate of about 16 cwt. per acre in Hérault; it is usually absorbed entirely during the year which follows its application. Its low potash contents makes it advisable to give simultaneously with it, potash salts, say from 360 to 450 lbs. per acre of chloride (muriate) of potash, sulphide of potassium or sulphate of potash.

The two kinds of oil cake which figure most frequently in manure lists are cotton seed and sesame (*Sesamum indicum*) the prices being respectively about £5 12s. and £6 per ton at Marseille.

The importance of these by-products to French agriculture should be an argument in favour of the cultivation of oil bearing plants. Were oil cake available, at a reasonable price, it would be a great boon to our northern agriculture, as a source, not only of nitrogen, but also of organic matter, so necessary under our hotter sun.

The Popularity of Gypsum.

This is another striking fact. We have seen the inclusion of plaster or gypsum in the manure formulæ of both Professor Degrully and Professor Lagatu. It is, in fact, almost invariably included in French vine manure formulæ. Though its exact mode of action seems somewhat obscure, its influence in increasing production is very generally admitted. Is this owing to its sulphuric acid? Does it act as a source of sulphur? Possibly. Lime is not nearly so extensively employed as gypsum in the manuring of Hérault vineyards.

The latter is far more soluble in water than carbonate of lime—about 166 times as soluble, in fact. Lime becomes carbonated and loses most of its solubility, soon after application, whereas gypsum, remaining unchanged, its diffusion in the soil would continue. Gypsum is worth 8s. per ton in France.

M. Zacharewicz,* in a recent article on the subject, after recalling Franklin's experiments in America some 60 years ago, which first led to its extensive use, points out that, when employed alone, it proved disappointing and was ultimately given up.

* *Revue de Viticulture*, 21 January, 1909.

Its recent popularity in France is due to experiments carried out by M. Oberlin. In addition to being an excellent diluent for concentrated manures, it has the power of decomposing certain fertilizing substances contained in the soil, such as silicate of potash. It is employed either raw or roasted (Plaster of Paris). The latter is, according to M. Zacharewicz, the cheaper form, raw gypsum being difficult to pulverize. As regards transport facilities also, plaster is more advantageous, a cubic metre weighing 2,000 kilos. as against 1,200 of raw gypsum

APPLICATION OF MANURES.

Opinions differ as to the best method of applying manures. Three ways are in use in Hérault.

1. In the small basins around each vine, made after the early winter cultivation by the operation known as *déchaussement* (*Journal*, vol. IX., p. 202).

2. In deep furrows, opened for the purpose, in the interval between the rows of vines.

3. Broadcast, over the whole surface, prior to ploughing.

The first is the one which has long been most usual and is even now very generally followed, though many authorities, including the late G. Foex, favour the third. With the deep winter ploughing, characteristic of the region, complete burial is secured, a condition which is essential in order to obtain the best results.

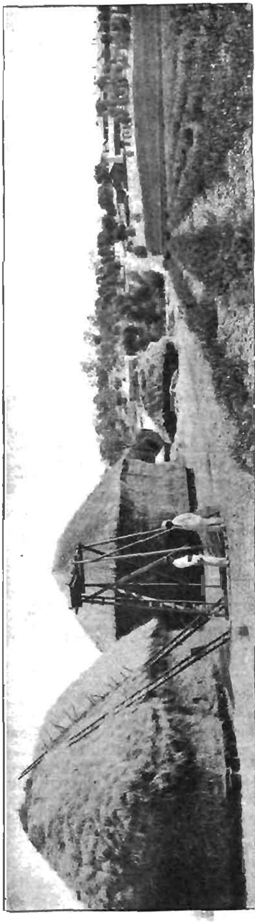
Of recent years, experiments conducted in various parts of France, in connexion with manuring generally, and not only as applied to the vine, have demonstrated the advantages of localization of manures, as opposed to their general dissemination throughout the whole of the soil. Localization is best secured by the second method and for this reason it is recommended in some quarters, though not generally carried out. The first method, it is true, localizes the manure to a considerable extent and subsequent cross ploughings have for result the ultimate spreading of the humus resulting from its decomposition throughout the whole surface soil to the depth to which it is cultivated.

YIELD OF RECONSTITUTED VINEYARD AT THE RUTHERGLEN VITICULTURAL COLLEGE: VINTAGE 1911.

G. H. Adcock, F.L.S., Principal.

In accordance with the practice of recent years, the following particulars are submitted of the yield of the reconstituted vineyard at the Viticultural College, Rutherglen, for the vintage 1911. It will be necessary to repeat that the vines are planted 10 ft. x 8 ft., are trellised on two wires, and pruned on the rod and spur system. Local growers will recollect that these vines occupy the site of our original vineyard which was destroyed by Phylloxera. The soil is anything but rich and the results achieved are due to the remarkable season, combined with thorough cultural attention and the judicious supply of plant food in the form of manure.

The season will long be remembered, for hardly in the memory of the oldest resident has there been one similar. Last winter was remarkably mild, with an almost total absence of the usual frosts. The summer was



GENERAL VIEW FROM STACKYARD. COLLEGE BUILDINGS IN DISTANCE.

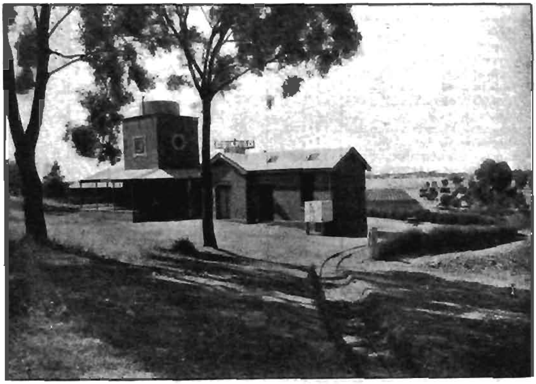
also an extraordinary one. We escaped the usual summer spells of heat, and had only an odd day now and then when the temperature was sufficient to cause comment. During the latter part of the summer, the weather was more like that of an Australian spring than summer. Grass is green and abundant. Fruit trees and Cootamundra wattles have come into bloom, and altogether the weather during March was rather typical of October. Heavy rains have been frequent. During the first two months of the year we had approximately half the previous year's record.

These circumstances, while they were conducive to a larger yield, prevented the uniform ripening of the berries. It was also very difficult to get a satisfactory sugar strength for wine-making, and all round the wine has had to be made with grapes below the usual percentage of sugar, and of a most irregular ripening. The heavy rains, too, caused considerable losses. Berries burst, became mouldy and damaged the bunches. It was quite common to find on the same bunch, green, ripe and mouldy grapes.

The birds, as usual, demanded a heavy toll of our crop and this in spite of bird scarers. This season, the Friar birds, or Leather Heads, were particularly active and aggressive and had to be shot in numbers. One satisfaction is ours, and that is we suffered less this season from human thieves than in former years. This is not, one ventures to think, due to any moral improvement in that section of the community responsible for such losses, but may be accounted for by the more vigilant watch kept. We did lose in this way, and then not so much by the grapes actually eaten as by the unripe bunches wantonly destroyed by being plucked and thrown on the ground.

The price of the crop has been computed at current local rates, viz., £7 per ton. It was thought hardly fair, in view of the high market value of grapes here, to keep the computations so much below actual values as was done last year.

Our young vines, planted three and two years respectively, made a phenomenal show of fruit. This is largely attributable to the care exercised in preparing the ground, planting, and subsequently. Those growers who inspected these were struck with the immense crop and asserted they had never seen it equalled These are table and wine varieties. Grapes of the former were packed in cork dust and placed in the Government Cool Stores to test their keeping qualities. Of the latter, we are making wine. For experimental purposes, and to know just the character of wine these new importations will produce under our conditions, we have had several small lots made separately into wine as arranged last year. This involves a lot more work, but should be well worth the extra trouble.



STILL HOUSE AND CELLARS.

As was noted last year, readers are again reminded that these figures must not be taken to indicate the relative value of the various stocks. Once again, Shiraz and Malbec on Rupestris du Lot come out low in yield. As previously pointed out, this disparity is in no way due to the stock. These varieties on this stock are planted close to the fence and have to find the bulk of the fruit selected and removed by feathered and other thieves. This applies also to both lots of Burgundy. Of the varieties ordered from France by the writer in 1903, and planted out as grafts in September, 1907, viz., Aramon, Alicante Bouschet, and Grand Noir de la Calmette, the returns as given herewith are very promising.

When over a series of years, in poor soil, an increasing return can be shown, and a gross revenue of over £30 per acre produced, it must be conceded that there is money in viticulture when intelligently carried out.

YIELDS, COLLEGE VINEYARD: VINTAGE 1911.

Variety, Date of Planting, and Stock.	Sp. gr. Must.	Yield per Vine.	Yield per Acre.				Value per Acre at £7 per Ton.		
		lbs.	tons	cwt.	qrs.	lbs.	£	s.	d.
Shiraz (1903)—									
Rupestris Metallica (Cape)..	1·095	16·57	4	0	1	27	28	3	5
Hybrid 3306	1·095	12·81	3	2	1	0	21	15	9
A.R. G. 1	1·095	11·97	2	18	0	18	20	7	1
Hybrid 3309	1·097	11·23	2	14	2	9	19	2	1
Rupestris du Lot ..	1·112	10·3	2	10	0	5	17	10	4
Burgundy (1904)—									
Riparia grand glabre ..	1·110	5·28	1	5	2	20	8	19	9
Hybrid 3309	1·110	4·34	1	0	3	23	7	6	8
Malbec (1904)—									
A.R.G. 1	1·103	19·98	4	17	0	6	33	19	4
Riparia grand glabre ..	*1·103*	*18·81*	*4*	*11*	*1*	*17*	31	19	9
Hybrid 3309	1·100	16·35	3	19	1	19	27	15	11
Rupestris Metallica (Cape)	1·103	14·08	3	8	1	16	23	18	9
Hybrid 10114	1·110	12·32	2	19	3	12	20	19	0
Rupestris du Lot ..	1·110	8·27	2	0	0	18	14	1	2
Cabernet (1904)—									
Hybrid 3309	1·102	19·16	4	13	0	11	32	11	8
Hybrid 3306	1·105	18·56	4	10	0	19	31	11	2
Rupestris Metallica (France)	1·095	16·39	3	19	2	14	27	17	5
A.R.G. 1	1·095	16·21	3	18	3	0	27	11	3
Rupestris Metallica (Cape)..	1·100	15·78	3	16	2	17	26	16	6
Rupestris Martin	*1·101*	*15·48*	*3*	*15*	*0*	*25*	*26*	*6*	7
Riparia grand glabre ..	1·096	14·13	3	8	2	16	24	0	6
Alicante Bouschet (1907)—									
Rupestris du Lot ..	1·085	14·21	3	9	0	3	24	3	2
Aramon (1907)—									
Rupestris du Lot ..	1·085	19·67	4	15	2	7	33	8	11
Grand Noir de la Calmette (1907)—									
Rupestris du Lot ..	1·082	13·33	3	4	3	4	22	13	6

EXPERIMENTAL MANURIAL PLOTS.

Test plots, each ¼ of an acre in extent, were set apart for manurial experiments as suggested by the manager of the Potash Syndicate whose head-quarters are in Sydney. The manures were supplied by the above-named firm, and the following are the results:—

Plot.	Manure per acre.	Yield per ¼ acre.
		lbs.
No. 1	Unmanured	2,333
No. 2	Superphosphate, 2 cwt. .. .. .. Sulphate of ammonia, ¾ cwt.	1,991
No. 3	Superphosphate, 2 cwt. .. .. .. Sulphate of ammonia, ¾ cwt. .. .. Sulphate of potash, 1 cwt.	2,740

The remarkable feature of these results is the decrease in the yield of Plot No. 2 below that of the unmanured portion. It should, however, be stated that our vineyard is kept in good heart by carefully supplementing the plant foods in the soil, and that "unmanured" in Plot No. 1 means only that no manure was applied last season.

GENERAL NOTES.

The Trial Shipment of Pears.

It is gratifying to record that the trial shipment of Williams' Bon Chrêtien pears, sent to London by the s.s. *Somerset* on the 14th February, and referred to in the March *Journal*, has turned out an unqualified success.

The prices cabled by the Agent-General (from 10s. to 19s. per package) are more than satisfactory, being equal to from 12s. 6d. to 23s. 9d. per case. These results justify the methods recommended in this *Journal*, and elsewhere, by the officers of the Department, viz., that pears, to carry successfully, should be cool-stored immediately after picking, packed in trays containing one layer only, and carried at a low temperature (just below freezing point).

It is expected that the success of this shipment will have a marked effect on the future trade with oversea ports. The export season, usually covering only ten weeks, will be extended by another fortnight or three weeks. The disposal of large quantities, by early export, will relieve the pressure usually coming later on, and should prevent, to a great extent, the gluts we have occasionally experienced in our local markets.

Due recognition should be given to the action taken by the manager of the Government Cool Stores, at Doncaster, who, last September, brought this matter before the conference of fruit-growers at Ardmona. That officer then strongly advised the growers to ship this particular variety of pear in large quantities, and detailed the methods that should be adopted. —*J. G. Turner.*

ANSWERS TO CORRESPONDENTS.

The Staff of the Department has been organized to a large extent for the purpose of giving information to farmers. Questions in every branch of agriculture are gladly answered. Write a short letter, giving as full particulars as possible, of your local conditions, and state precisely what it is that you want to know. *All inquiries forwarded to the Editor must be accompanied by the name and address of the writer.* This is very necessary, as sometimes insufficient information is furnished by the inquirer.

LIMING OF SOILS.—D.F.G. inquires as to best form of lime to apply to different soils.

Answer.—The particulars forwarded are scarcely sufficient. However, the use of freshly burned slaked lime for all soils of a stiff nature, such as clays and loams is advised; for sandy ones the ground unburnt deposit may be used. The difficulty experienced in spreading slaked lime is well known, and the importation of an up-to-date lime spreader is recommended. It would be a great help to farmers in the district, as such machines would enable one to overcome the difficulties attending hand spreading. The advantage of caustic lime over other forms of lime consists in its being most active, and in its most concentrated condition. It is therefore the most economical to buy when carriage is taken into consideration. Fifty-six pounds of caustic lime are equal to 100 lbs. of ground limestone The caustic lime possesses the property of exhausting the organic content of the soil, and this fact suggests the advisability of using the weaker acting ground limestone on light sandy soils. On the other hand, this action is considerably modified and weakened in heavy soils by the presence in such of moisture and carbonic acid. (See *Journal* for September, 1908, for description of lime spreader).

RUPTURE.—O.C. asks how to treat a ruptured foal.

Answer.—It is not uncommon for ruptures of this nature to disappear of their own accord as the animal grows older. Time should be allowed until the animal is two years old. A veterinary surgeon should be consulted in cases where the enlargement shows signs of increasing. O.C. is reminded that his full name and address should have been supplied.

MILK FOR CALVES.—A.G.H. asks whether the milk from the separator should be given whilst still warm to the calves.

Answer.—Yes; but the froth should first be carefully removed.

KEEPING MILK SWEET OVER SUNDAY.—G.R. states that he objects to all unnecessary Sunday work, such as carting milk to a cheese factory. He asks what would be the best method of keeping milk sweet over Sunday. There would be three batches—Saturday evening, Sunday morning and evening?

Answer.—The best method of keeping milk sweet over Sunday is to exercise scrupulous cleanliness, and to reduce the temperature to below 60 deg. Fahr. The milk should be fit for cheese-making on the Monday under favourable conditions. Preservatives of any kind are not recommended.

REDUCED YIELD OF MILK.—H.S. writes that, although his cows have been milking only three months, they are not yielding nearly as much milk as previously.

Answer.—Cows require succulent fodder for milk production. When hay is fed, it should be chaffed and soaked with as much water as it will soak up for 12 or 24 hours, or they will not be able to keep up the flow of milk.

SEDIMENT IN MILK PAN.—H.S. desires to know the cause of the large amount of sediment which remains at the bottom of the pan when milk is scalded.

Answer.—When milk is heated in a vessel directly over the flame, a portion of the albumen coagulates, and forms a coat on the bottom. To avoid this, the milk should be scalded by standing the vessel containing the milk in a vessel of boiling water until the desired temperature is obtained—160 to 180 degrees is the most suitable for scalding milk. Any disease germs that might be present would be destroyed at that temperature. The temperature should be ascertained by a thermometer which can be purchased for 1s. 6d. from any dairy implement agent.

CARE OF DAIRY UTENSILS.—H.S. states that, although his milking buckets are kept scrupulously clean, they are going into holes as if they were corroding.

Answer.—Buckets and other utensils generally used for handling milk are made of iron or steel, and then coated with tin. If anything rough, such as sand soap, ashes, &c., is used when these vessels are being cleaned, the coat of tin is soon worn off, and the iron left bare. This is attacked by the acid in the milk, which soon gives it a honey-combed appearance, and no amount of scouring will get the dirt out of the pits so formed. If the vessels are worth it, they can be re-tinned at a cost of a few shillings, which will make them as good as new. To clean utensils, first rinse out the milk with cold or luke-warm water, then scrub well with a stiff brush in boiling water in which a little washing soda has been dissolved. Rinse with boiling water, and leave upside down to drain and dry. Never use a cloth for dairy utensils, as it is almost impossible to keep it clean and sweet. Never use dairy utensils for water, as it causes them to rust where the tin is worn or scratched off.

UNDERGROUND SILO.—S.E. asks whether it is advisable to build an underground silo. As he has plenty of sand, sandstone, and water he proposes to make it of concrete.

Answer.—The Department does not recommend the use of an underground silo. Unless it is in a very dry position it is difficult to keep drainage out; also the labour of emptying an underground silo is very great, as the silage is heavy to handle. If concrete is to be used, it would cost less and be more satisfactory to have the silo entirely above ground. The dimensions of a 60-ton silo are 15 feet in diameter by 20 feet high. It is impossible to say the exact proportions for mixing without knowing the material which is to be used, but 5 parts metal and 2 parts sand and 1 part cement make a good mixture in most cases. If the silo is reinforced with wire it would take about 30 casks of cement to build one of the above dimensions.

OVERGROUND TANK.—E.C.L. desires dimensions of, and materials required for, a 20,000 gallon tank, not to be more than 7 feet high and to open at the top.

Answer.—An overground tank of 20,000 gallon capacity, 7 feet high, would require to be about 22 feet square. A square tank would take less material than an oblong one, but a circular shape is preferable. Either reinforced brick built in cement and rendered, or reinforced cement concrete would be satisfactory. If good metal and sand be procurable near the site, concrete would be cheaper than brick. The following are the quantities for a brick and a concrete tank respectively:—

BRICK.		CONCRETE.	
Bricks ...	... 9,000	Metal ...	... 18 cubic yards
Cement ...	... 12 casks	Cement ...	.. 21 casks
Sand ...	... 10 cubic yards	Sand ...	... 11 cubic yards
Wire, 8 gauge	... 2 cwt.	Wire, 4 gauge	.. 5 cwt.
		Wire, 6 gauge	.. 2 cwt.

STATISTICS.

Rainfall in Victoria.—First Quarter, 1911.

TABLE showing average amount of rainfall in each of the 26 Basins or Regions constituting the State of Victoria for each month and the quarter, with the corresponding monthly and quarterly averages for each Basin, deduced from all available records to date.

Basin or District.	January.		February.		March.		Quarter.	
	Amount.	Average.	Amount.	Average.	Amount.	Average.	Amount.	Average.
	points.	points.	points.	points.	points.	points.	points.	points.
Glenelg and Wannon Rivers	12	121	501	89	172	149	685	359
Fitzroy, Eumerella, and Merri Rivers	18	147	627	164	286	165	931	476
Hopkins River and Mount Emu Creek	29	145	677	104	387	160	1,093	409
Mount Elephant and Lake Corangamite	45	153	510	107	465	176	1,020	436
Cape Otway Forest ...	74	211	655	147	602	258	1,331	616
Moorabool and Barwon Rivers	122	148	429	116	568	177	1,119	439
Werribee and Saltwater Rivers	131	144	447	134	672	183	1,250	461
Yarra River and Dandenong Creek	119	230	624	172	784	277	1,527	679
Koo-wee-rup Swamp ...	127	242	366	158	711	270	1,204	670
South Gippsland	385	224	323	171	649	315	1,357	710
Latrobe and Thomson Rivers	359	231	356	166	647	298	1,362	685
Macallister and Avon Rivers	623	146	285	149	501	209	1,409	504
Mitchell River	610	237	343	219	560	223	1,513	679
Tambo and Nicholson Rivers	663	200	438	163	739	282	1,840	645
Snowy River	888	252	454	217	788	273	2,130	742
Murray River	204	111	494	101	238	150	936	371
Mitta Mitta and Kiewa Rivers	316	169	611	142	307	308	1,234	619
Ovens River	343	174	820	131	271	290	1,434	595
Goulburn River	245	133	537	102	233	176	1,015	411
Campaspe River	128	116	853	94	393	149	1,374	350
Loddon River	44	96	644	83	219	116	907	295
Avon and Richardson Rivers	18	71	743	62	163	98	924	231
Avoca River	57	67	578	62	208	107	843	236
Eastern Wimmera	31	86	739	72	247	119	1,017	277
Western Wimmera	17	69	412	61	95	83	524	213
Mallee District	32	55	346	57	114	79	492	191
The whole State	187	131	500	109	316	170	1,003	410

100 points = 1 inch.

From the 11th to the 18th January, a succession of heavy monsoonal rains fell over the eastern half of the State, especially favouring Gippsland. To these were mainly due the heavy records in Gippsland river basins for this month. Over the rest of the State January was drier than normal.

In February, conditions were equalized by tremendous monsoonal rains falling over the western half of the State, and especially favouring the Mallee and northern country. These rains fell from the 6th to the 10th, and were absolutely without precedent over the northern and north-western plains. All parts of the State had a rainfall well above the average.

March was also remarkable for phenomenally heavy rains, these falling mainly over South-Central and Gippsland districts. Floods caused by them did much damage, especially in Gippsland. Over practically the whole of the State the rainfall was again above average.

Generally, it will be noticed that for the quarter the rainfall has been 6 inches above the normal.

H. A. HUNT, *Commonwealth Meteorologist.*

Perishable and Frozen Produce.

Description of Produce.		Exports from State (Oversea).		Deliveries through Government Cool Stores.	
		Quarter ended 31.3.1911.	Quarter ended 31.3.1910.	Quarter ended 31.3.1911.	Quarter ended 31.3.1910.
Butter	lbs.	14,289,712	9,357,852	13,499,416	6,971,720
Milk and Cream ...	cases	1,325	66	21	10
Cheese	lbs.	127,080	52,200	135,529	94,580
Ham and Bacon ...	"	78,240	480	...	...
Poultry	head	2,880	1,080	2,511	1,948
Eggs...	dozen	...	...	12,276	9,506
Mutton and Lamb	carcases	247,045	261,902	18,963	39,952
Beef	quarters	4,039	5,283	...	...
Veal	carcases	1,304	919	35	53
Pork...	"	1,942	37	1,373	50
Rabbits and Hares ...	pairs	34,464	179,592	21,936	32,016
Sundries	lbs.	...	...	77,225	38,924

R. CROWE, *Superintendent of Exports.*

Fruit, Plants, Bulbs, Grain, &c.

Description of Produce.	Imports.		Exports.		Description of Produce.	Imports.		Exports.	
	Inter-State.	Oversea.	Inter-State.	Oversea.		Inter-State.	Oversea.	Inter-State.	Oversea.
Apples ...	180	2	43,744	169,709	Lemons ...	4,172	2,885	90	82
Apricots ...	2,650	—	764	—	Lentils ...	—	104	—	—
Bananas, bs.	66,186	—	—	—	Linseed ...	—	141	—	—
Bananas, cs.	6,971	110	739	—	Mace ...	—	10	—	—
Barley ...	24,719	75	—	—	Maize ...	—	157	—	—
Beans ...	—	68	—	—	Melons ...	193	—	—	—
Black berries	747	—	9	—	Nectarines	—	—	116	—
Black Currants	1,154	—	—	—	Nutmegs ...	—	140	—	—
					Nuts ...	335	2,065	—	—
Bulbs ...	8	174	30	16	Oats ...	5,306	153	—	—
Cherries ...	8	—	47	80	Oranges ...	1,253	2,143	27	6
Chillies ...	—	431	—	—	Passion ...	1,545	—	234	1
Cloves ...	—	30	—	—	Peaches ...	13	—	4,580	8
Cocoa beans	—	1,378	—	—	Pears ...	20	2	173,519	19,250
Cocoanuts..	—	—	12	—	Peas, Dried	8,366	43	—	—
Coffee beans	80	2,257	—	—	Persimmons	131	—	—	—
Copra ...	—	520	—	—	Pepper ...	—	211	—	—
Cucumbers	559	—	3	—	Pineapples	26,649	—	1,051	241
Currants ...	—	400	—	—	Plants, Trees, &c.	22	177	84	22
Dates ...	—	2,129	—	—					
Figs ...	2	670	—	—	Plums ...	—	—	48,694	480
Fruit—					Potatoes ..	80	1	—	—
Canned ...	—	—	—	2,334	Quinces ...	191	—	25	—
Dried ...	3	34	—	1,273	Rice ...	3,894	44,118	—	—
Mixed ...	26	6	10	—	Seeds ...	2,713	8,830	—	—
Grapes ...	53	—	752	105	Tomatoes ...	6	—	473	18
Green ginger	—	1,240	—	—	Vegetables	605	136	—	—
Hops ..	—	621	—	—	Wheat ...	26	20	—	—
Jams, Sauces, &c.	—	—	—	2,197	Yams ...	—	186	—	—
Totals ...	103,346	10,145	46,110	175,714	Grand Totals	158,896	71,667	275,003	195,82[illegible]

Total number of packages inspected for quarter ending 31st March, 1911 = 701,358.

J. G. TURNER, *Senior Inspector, Fruit Imports and Exports.*

THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

Vol. IX. Part 6. 10th June, 1911.

PROPAGATION OF FRUIT TREES.

(Continued from page 345.)

C. F. Cole, Inspector, Vegetation Diseases Acts.

PLANTING.

After preparing the soil for planting, select a wooden measuring rod, for preference a piece of 1½-in. x 2½-in. oregon 18 or 26 feet long. Measure off 3 feet from one end of the rod, marking it with a shallow saw cut. From this cut again measure off and mark similarly the necessary number of rows 4 feet apart. If the rod is 26 feet long, it will give six rows with a 3-feet margin upon each side of the outside rows. If 18 feet long, there will be four rows with a 3-feet margin. Leave a 6-feet alley between the lands to be planted. Should the planter desire the rows to be more than 4 feet wide, the measuring rod should be marked accordingly.

The rod will do for measuring any area for planting, whether formed into lands or not, and will last for years with care. A good plan is to nail a strip of galvanized hoop iron the whole length of the rod, top and bottom, after the saw-cuts have been made.

Now place the rod into position and peg off the rows at both ends of the land to be planted. Great care should be exercised in seeing that the first row is perfectly straight, otherwise the whole area will be affected. To get the first row straight, take the fence as a guide. If the headland be 12 feet wide from the fence, the first row should start 3 feet from the edge of the headland, or 15 feet from the fence.

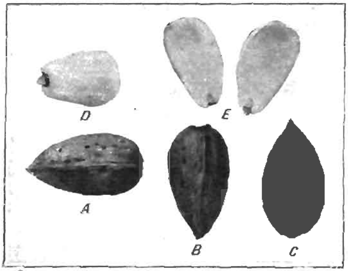
It will then be necessary, if the garden line is not long enough, to mark off the land into lengths. To do this, the tops of the pegs at one end of the land should be painted white, or a piece of white paper tied around them. Then, while one person holds the pegs into position, another sights them. If the planter wishes his rows to be straight, he must sight, and not measure with a rod.

Now peg down the planting line, which should be drawn taut. Pass a hand-rake or spade along the line to remove any small lumps of soil, &c.,

that may be the means of keeping it other than straight. Lift the peg attached to one end of the line, shake up the latter once or twice vertically, draw taut, and replace. Two or three weights should then be placed upon the line at points equidistant from each other. Lumps of earth will suffice to prevent the line from getting out of straight when cutting out, or forming a drill for planting. If planting rooted stocks, force the spade into the soil to the depth required, keeping the blade close to the line, without displacing it. The average depth for planting rooted stocks is 5 inches.

Now remove the garden line; and, with the spade (using the blade half on) place the soil upon the edge of the freshly-opened trench or grip. If any lumps of earth are present, reduce them to a fine state with a few strokes of the back of the spade. Sprinkle bonedust along and upon the removed soil, and mix it well before filling in; 1 lb. of bonedust to 6 yards will be sufficient to give the stocks a good start.

Take the stocks ready for planting, and place them in small lots, about six to the yard, along the open grip for a few yards. When planting, hold them in an upright position with one hand, and, with the other, draw into the grip enough soil to keep the stock in the position indicated. Then fill in the rest of the soil with the spade and tread firmly with the flat of the foot to expel the air, care being taken to see that the stocks are kept perfectly upright. Plant 6 inches apart.



8. METHODS OF PLANTING FRUIT STONES.

A. Right method; B and C. Wrong methods; D. Kernel showing shoot in suitable position; E. Split kernel showing shoot.

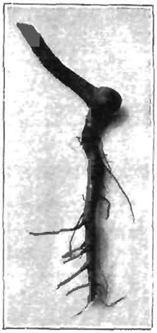
When planting, stocks should be kept covered with a moist bag until wanted, and not too many laid out along the grip at one time. The roots of evergreen stocks should on no account be allowed to become dry.

When planting out cuttings permanently for working upon, there is no necessity to open out a grip, but to force the blade of the spade down into the soil to the depth of half the length of the cuttings. The wall of this cut should be perpendicular, as nearly as possible, to insure the cuttings being upright. This can be done by standing off from the garden line and slightly inclining the handle of the spade towards the body. Place the apex end of the cutting in this cut, and press it down to the depth of half its length, when it should touch a firm bottom. If no such bottom can be touched, work the cutting up and down a little, so that some soil is forced down each time by the end of the cutting. Plant the cuttings about 4 inches apart. Then tread the soil firmly to close up the cut. If this is overlooked, there is every likelihood of a poor strike, owing to the air having free access to the forming callus.

Ground that is going to be used for planting out cuttings should be ploughed deeply in early autumn and allowed to settle; only the surface

should be cultivated, so as to keep down any weed growths. If planting in deep and freshly-prepared ground, tread the soil with the flat of the foot along the line before making the cut.

When planting out almond, apricot, or peach stones permanently for working upon during the following budding season, make a shallow drill (about 1½ inches deep) along the planting line with the end of a hoe blade. Place the stones 3 inches apart in the drill, and press them slightly into the soil with the thumb or finger. Care should be taken to put the stones upon the flat. (See illustration No. 8.) If planted like Fig. 8B or 8C there is a risk of a percentage of the stocks having twisted stems, similar to that shown in No. 9. Cover the stones with 1½ in. of sand or light soil If planting in stiff soil and no sand or light soil is available, 1 inch of well-pulverized soil will be ample. There is a difference of opinion regarding the proper method of planting stones, nuts, &c. Some maintain that it is correct to place the end from which the root emerges downwards; this is generally the pointed end. Others hold that they should be placed upon the flat. I consider the latter to be the correct method, not only from results obtained, but from the natural position in which seeds, &c., are found when shed upon a level surface.



9. RESULT OF WRONG METHOD OF PLANTING.

ROOT-GRAFT PLANTING.—Root-grafts should be planted well down, to protect the uniting parts from adverse weather conditions which prevail at times in the spring and early summer. It will also give a chance of increasing the root supply by the buds upon the scions striking root. Grafts so planted are not liable when growing to sway, and thereby cause the root below the union to become bent during wet squally weather.

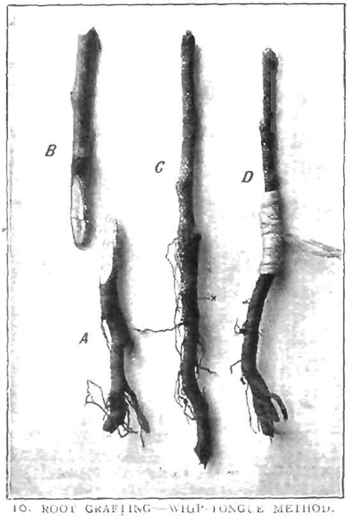
The best results are obtained by planting out direct from the grafting bench. If, owing to weather conditions or other pressing work, there should be any delay, the grafts should be heeled in thickly in a sheltered position for the time. Care should be taken that the bound part is placed well below the surface. Plant out permanently when the first opportunity offers, and before the binding starts to decay.

When planting, handle with care. Open out a grip and plant the same distance as rooted stocks, if required for permanently working upon. After filling in and treading carefully with the foot, press the soil firmly around the scion with the thumbs and index fingers of both hands. It often happens that there is a heavy fall of rain, which causes the prepared soil to become for the time being unfit for planting. To plant while in this condition is not only faulty, but injurious. If the soil is of a sandy or porous nature, planting may be continued shortly after without injury to the young stocks. If, on the other hand, it is heavy, and of a retentive nature, and liable to puddle, planting should be delayed, otherwise the puddled soil will set about the roots, and cause the stocks to become stunted.

With cuttings that have formed callus, open out the grip and plant them the same as rooted stocks. On no account should cuttings be allowed to callus, or start rooting before being planted out where they are to remain permanently.

APPLE STOCKS.

WHIP-TONGUE GRAFTING METHOD.—Select suitable Northern Spy roots, rinse them carefully in water to remove any dirt, and cut into 4-inch lengths. Care should be taken that no part of the freshly-cut and selected roots is bruised or damaged. When cut, place them all the same way upon the grafting bench. The roots can be cut with a pair of secateurs. Then secure well matured Northern Spy cuttings of one season's growth, and with a sharp knife cut them into lengths the same as the roots. Cut close to the bud upon the terminal end of the cutting, which is termed a scion (Fig. 10B.) Secateurs, however sharp, are not suitable for cutting scions. The point of the knife should be rounded off as shown in Fig. 1.



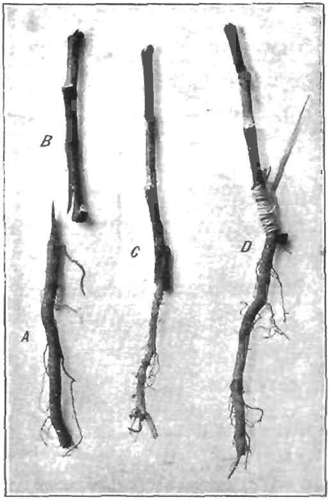
10. ROOT GRAFTING—WHIP-TONGUE METHOD.

A. Root: *B.* Scion: *C.* Root and scion united: *D.* Bound ready for planting: *X.* Commencement of tying.

When the roots and scions are ready, take a suitable grafting knife with a keen edge and make a clean upward cut about 1 inch in length at the upper end of the root. Then pass the blade downwards about ⅜ inch, forming a slice tongue in appearance. (Fig. 10A.) Select a scion the same thickness, or as nearly as possible, as the root. The scion may be thinner, but not thicker than the root. At the lower end of the scion make a downward cut, the same length as that already made upon the root. Then pass the blade upwards, forming the slice tongue (Fig. 10B), and apply the scion accurately to the root, being careful to see that the inner bark of the scion exactly fits the inner bark of the root upon one side, without changing their position. (Fig. 10C.)

Holding the united graft by the root end with one hand, and with a piece of prepared raffia 16 to 18 inches long, start the tying a little below the cut with the other. Press the flat of the thumb upon the end of the raffia. Give a turn or two to prevent slipping, and bind upwards to a little above the upper end of the union. Finish off with two half-hitches below the upper end. Thoroughly cover the union. (Fig. 10D.) Success depends largely upon the tying. If bound too tightly, the tender bark of the root is injured; or, if too loosely, failure to unite will be the result. On no account allow the inner bark of the scion to become separated from the inner bark of the root whilst tying.

ROOT-INSERTION GRAFTING METHOD.—Prepare the root and scion the same as in the whip-tongue method, but cut the lower end of the scion at bud. (Fig. 11B.) Upon the root make two upward cuts, one on each side, in the form of a wedge. (Fig. 11A.) Then, close to the lower end of the scion, and the opposite side to the bud, pass the blade inwards and upwards, making a cut the same length as that upon the root. (Fig. 11A.) Insert the root, fitting the inner bark of the scion exactly with that of the root, on the one side. (Fig. 11C.) Hold the scion in the one hand, and start to tie at the upper end of the cut, working down to the lower. Leave the bud exposed (Fig. 11D), and finish off with two half hitches. (Fig. 11D.) Whilst tying under this method, there is a greater risk of the bark becoming separated than in the whip-tongue method. The writer favours insertion if the roots are small.



11. ROOT GRAFTING—INSERTION METHOD.
A. Root; *B*. Scion; *C*. Root and scion united; *D*. Bound ready for planting.

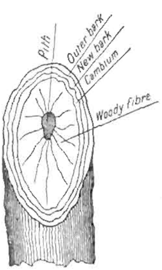
The grafts, when finished, should not be allowed to remain dry, but be damped and heeled in light soil in a sheltered position until required for planting out. Roots and cuttings for grafting should be kept heeled in moist soil until required. On no account allow them to lie about and become shrivelled. Such roots or cuttings are useless for grafting. Owing to the Spy carrying its foliage late in the the season, it will be necessary to strip off any leaves upon the cuttings, *i.e.*, where an early start is being made. Cuttings taken from worked stocks carrying live dormant buds or from stools are preferred. They are not so hard to cut as those secured from old matured trees.

Root-grafting may be performed during the months of June, July, August, and early September. Fig. 12 shows the cambium wood, which must be placed together with the root and scion if the union is to be a success.

When propagating varieties immune from Woolly Aphis (*Schizoneura lanigera*), there is no necessity to double work. Select nice Spy roots, and graft them directly (whip-tongue method). But varieties subject to attack from this pest must be worked by grafting or budding upon resistant stocks that are sufficiently high above ground-level to prevent them from shooting their own roots into the soil and becoming a blighted mass.

Many private growers are under the impression that once a variety is worked upon a blight-proof stock it becomes immune against all disease. The following will explain the term "worked upon blight-proof stocks":—In past years, the apple was propagated chiefly upon seedling stocks raised from selected varieties. Being non-blight-proof, they were in due course attacked by Woolly Aphis. This insect, working below as well as above ground, gave growers a busy time. Finally, they found it impossible to ward off an attack from the roots for any lengthy period. The roots being the vital part and suffering mostly, the trees soon became debilitated, and in many instances died out.

The introduction of two blight-proof varieties (Winter Majetin from England, and Northern Spy from America), by Messrs. Lang and Co., nurserymen, proved a boon to apple-growers. As the roots were free from attack, the growers were able to combat it above ground. The reader will recognise from this that, by working a variety upon a blight-proof stock, it means "not subject to blight below the bud or graft," and not immunity for the whole tree.



12. CUT SCION SHOWING DIFFERENT PARTS OF TREE.

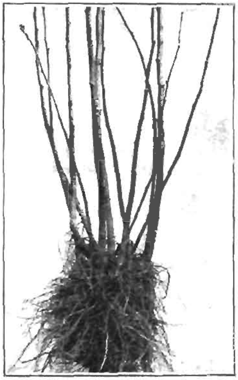
LAYERING.—Undoubtedly the best method for raising Spy stocks is from layers or stools. Once they are established and properly managed, they will produce well-rooted stocks with straight stems for many years.

Mark off the prepared soil with the number of rows to be planted 4 feet or 5 feet apart. Place the garden line in position and work the soil back to the centre of the rows from both sides of the line, forming a slight depression. Lift the line, draw taut, replace, and open out a grip down the middle of the depression. Then plant the spy stocks selected from layers or stools; failing these, from root-grafts.

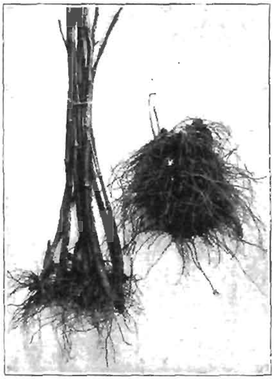
Plant 2 feet apart in the rows early in June, and mix a little bonedust with the soil before filling in. In August, cut back to within an inch of the ground-level, so as to get a supply of buds near or below the soil to push out. The following August cut back to two buds any weak or light growth, pegging down the stronger parallel with the row or other planted stocks. The buds upon the pegged-down growths, being now brought into a vertical position, will send up a sufficient supply of shoots for working upon sound lines. About November, mould them up lightly by removing some of the higher soil from the middle of the rows. During the following winter remove soil about the layers and cut away any light shoots that may have rooted, hardening back others close to the main layer.

The propagator should not be too eager in removing rooted shoots from the main layers until after the fourth season, but will be repaid by cutting hard back, forming good well-rooted crowns for future use. From now out the operator will require to use his own judgment regarding the growths he cuts hard back, and those he leaves for pegging down after removing any that may be rooted. In the winter mould up after cutting away any rooted stocks and the pegging-down is finished, and again in November or December. Deep or over-moulding should be avoided.

STOOLING.—This method is somewhat similar to that of layering, but instead of pegging down the unrooted shoots they are cut hard back each year, so as to encourage as many as possible to show out. The second season from planting, and after the shoots have been cut back to within an inch or so of the stool, mould lightly and again in November or December. If the shoots do not root, this moulding will cause them to become bleached close to the crown of the stool. Upon being hardened back, shoots that give the best results will be formed. When removing rooted shoots in the winter, leave any that are very small for the following year; also any that are weak and spindly. Notice illustration showing rooted shoots (now stocks) cut from stool. (Fig. 14).



13. ESTABLISHED STOOL CARRYING ROOTED STOCKS



14. ROOTED STOCKS CUT FROM STOOL.

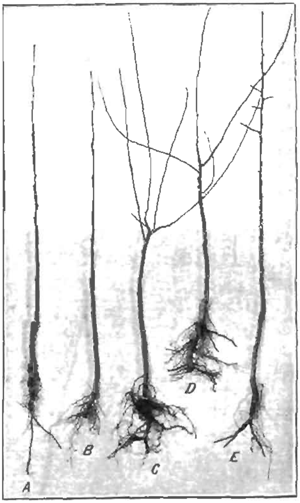
The cooler and moister districts are the best adapted for the raising of Spy stocks by these two methods (layering and stooling), as the rooting of the shoots is controlled by even moisture during late summer and early autumn. From healthy, old, and well-established stools, and those putting up medium and not over-strong shoots, the best results are obtained. The writer advises that layering and stooling should be worked conjointly.

When planting, select a permanent site in the nursery, and one where the layers or stools will not be interfered with. Keep the beds free from weeds and well cultivated. With healthy and well-established stools no manure is required, the aim of the propagator being to encourage medium and not rank growths. Light or sandy loam should be used for moulding purposes. The illustration on this page shows a stool that took four years to establish. For twelve years it has produced annually an average of 95 per cent. of well-rooted shoots or stocks. When photographed, it had twelve rooted shoots.

PEAR STOCKS.

The stock that should be used for propagating the many varieties of pear upon is the seedling raised from pips selected from hardy and free-seeding kinds. Selected seed can be imported so reasonably, either direct from France or America, or through any seedsman of repute, that it is questionable whether it pays to trouble about saving or securing suitable fruit and washing out the seed.

Those who wish to save pear seed should be guided by the following:— Only save those pears that have good plump seed, and from varieties that make a good average growth, such as Alexandrina Bivort, Beurré Capiaumont, and L'Inconnue. When the fruit is ready for seed, place them in old cases or tubs, or in pits or heaps, and keep covered. When rotten, partly fill a tub or suitable vessel and work up with the hands to a gruel. Add water, mix well, and strain through a sieve fine enough to prevent the seed passing through. Rub well while straining through the sieve. Applying water freely will force out any seeds that may be left in the cores. Continue this treatment until clean. Then spread the seed upon bags or something suitable, place under cover, and allow to dry. When dry, rub well with the hands to separate any seed that may be stuck together. It will then be ready for planting. Keep dry and away from mice or other vermin.



15. TYPICAL STOCKS.

A. Apple Stock—Root Graft; *B.* Apple Stock—Layer or Stool; *C.* Plum Stock—Cutting; *D.* Quince Stock—Cutting; *E.* Pear Stock—Seedling.

In May, the seed should be sown in drills made 1 inch in depth by 6 to 8 inches in width. The rows should be far enough apart to allow the cultivator to pass through. The bottom of the drill should be fairly level; sow evenly, but not too thickly. Take a piece of board the width of the drill and about 2 feet in length, and nail a short piece upon one side to act as a handle. Pat the seed lightly with this, and cover with sand or light soil to the depth of 1 inch. A fairly heavy loam in a moist cool district is most suited for raising seedlings. It will repay the planter to dig into the soil a little bonedust before opening out the drills. The seed beds should be kept perfectly free from weed growths, and removed before they grow to any size in the rows; or else in removing them injury will be done to the germinating or sprouting seed.

During the summer months the growing pips should not be allowed to become dry, but should be irrigated if possible. The following winter, if well grown, they should be ready for planting out permanently for budding upon. If small, let them remain another season in the beds. The illustration on page 368 shows seedling stock twelve months from seed.

In the cooler and moister districts of the State, and where the soil is of a heavy and retentive nature, many varieties worked upon the seedling pear make gross and rapid growth, taking years to come into bearing. Working upon the quince stock is an advantage. The slower growth of the quince influences that of the pear, and causes the latter to become productive much earlier. Again, where the position is a wet one, and the soil heavy, the quince is far hardier, and better adapted than the pear. With the well known variety, Keiffer's Hybrid, which refuses to set its blossom when growing in certain localities and upon strong-growing soil, possibly this difficulty would be overcome by using the quince as a stock.

As there are only a few varieties of pears that flourish when worked directly upon the quince, it is necessary to double-work, *i.e.*, by first working a selected variety, like Beurré Diel, Beurré d'Amanalis, or Vicar of Winkfield, upon the quince, and then working the desired variety upon the yearling pear growth. Pears worked upon the quince should not be planted in light soils or dry localities. If so, the planter will be disappointed.

The best variety of quince for working the pear upon, and one that the writer recommends, is the Hereford, easily propagated from cuttings or stools; failing this, seed or cuttings taken from any commercial varieties.

QUINCE STOCKS.

The quince thrives best upon a heavy deep moist soil or loam, overlying a clay subsoil. The stock for propagating upon should be raised from seedlings, or rooted cuttings taken from seedling varieties or other strong-growing ones.

When saving seed, the fruit should be treated the same as pears, and allowed to rot. Then cut or break open, remove the cores, and press with the hands to force out the seed. Wash and treat the same as pear seed, when it will be ready for planting.

Sow at the same time and in the same manner as pear seed. Thin cuttings—no thicker than an ordinary lead pencil—should be selected. Do not allow cuttings to suffer from the want of moisture during the rooting period.

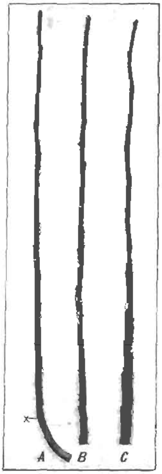
APRICOT STOCKS.

For practical purposes, the best all-round stock for propagating the apricot upon is the seedling apricot. In moist districts or heavy retentive soils certain varieties of the apricot thrive well upon the plum.

The common Red Cherry Plum of commerce is far more suitable as a stock than La France (*Prunus Myrobalana*). Apricots worked upon this latter stock, if growing in a badly-drained land or receiving an excess of water suddenly, die out, especially the variety Oullin's Early Peach. The common Mussel Plum is a good stock, but owing to its habit of throwing up suckers is not likely to court favour with the planter. Owing to

the harder wood of the plum, the apricot, like the plum worked upon the peach, and *vice versâ*, is liable to break away at the union of bud or graft with the stock. The peach may be used as a stock, but the writer does not recommend its general use.

Plant stones, selected from mid-season or late varieties, in June or July. *The stones should have been kept in a dry state.* A good plan is to soak them in cold water a few days before planting, or until the moisture reaches the kernels. Test a few stones by cracking them, and drain off the water immediately upon finding the kernels moist. The soaking process is valuable, particularly if the weather is dry when planting, and likely to remain so.



16. CUTTINGS FOR RAISING ROOTED STOCKS.

A. Wrongly made Cutting — Should have been cut at *X*: *B.* Plum—Properly cut: *C.* Quince—Properly cut.

Apricot stocks should be planted out in the nursery where the soil is well-drained, loose, and warm. The stocks can either be raised in seed-beds, and transplanted the following planting season, or else planted directly in the beds for budding upon during the following autumn. (See section dealing with planting (page 361.)

PEACH AND NECTARINE STOCKS.

The best stock for propagating these fruits upon is the peach seedling. But in light soils, where the almond thrives better than the peach or nectarine, the seedling almond should be used as a stock. Several old growers in the Cheltenham district near the coast only plant the peach when worked upon the almond, claiming that not only are the trees more robust and productive, but that the fruit ripens a few days earlier than when worked upon peach stock.

Peach stones should be secured from seedling or mid-season varieties, if possible. As soon as the stones are secured, open out a trench in a fairly moist, warm, and sheltered position. Spread a layer of stones about 3 inches in depth, and cover lightly with sand or soil. Continue this treatment until the trench is nearly full, finally covering well over with soil. *The stones should not be allowed to get dry or too wet.* When planting in May or June remove the top soil, shovel out the stones, and sieve to remove any soil. A suitable sieve can be made by making a frame from 4-in. x ½-in. softwood, and nailing ½-in. mesh wire-netting upon the bottom.

Another method is to crack the stones carefully with a hammer and remove the kernels. To do this, get a block and place the stones upon edge, when a sharp clout upon the upper edge will force open the stone. Then spread the kernels upon moist ground in a sheltered spot and cover with moist bags for a few days before planting. When planting, any bruised or bad kernels are easily detected by giving them a slight squeeze. I do not favour this method, and consider it unnecessary. Besides being tedious,

there is a risk, if the weather sets in wet and cold, of the kernels rotting through the fleshy seed leaves being brought into direct contact with the soil at the germination period, when they should be protected by the hard outer sheath or shell.

The planting of stones should be carried out during May, June, and July. Plant kernels in late July or early August.

ALMOND STOCKS.

The almond thrives best upon a deep sandy or light loamy soil, well drained, and having a warm subsoil. The seedling almond stock is the most suited for propagating upon; but in soils where the almond does not thrive and the peach does, the seedling peach should be used. The almond may be propagated upon the plum, but the writer does not recommend its general use.

Nuts from the bitter or strong-growing sweet varieties should be planted for working upon. As good fresh nuts grow freely, they should be planted out permanently in the beds where they are to be worked. Plant in May, June, or July.

(To be continued.)

CITRUS FRUIT CULTURE.

E. E. Pescott, Principal, School of Horticulture, Burnley.

It has been estimated that the people of Victoria consume over four times the amount of citrus fruits that they produce. That is to say, there is produced only one-fourth of our necessity in oranges and lemons.

During the year 1910, 34,528 packages of lemons and 302,966 packages of oranges were imported into this State. It is calculated by Californian authorities that California will export this year nearly 50,000 car loads of citrus fruits; 10,000 car loads are also expected to be shipped from Florida; 10,000 from Italy, and 40,000 from Spain. A car load represents a good many bushels. Some of these fruits will assuredly come to Victoria.

Can we not produce at least what we require? Why should our money be sent to the support of other countries when we can readily produce all we need? We have both suitable soil and climate, as evinced from the fact that citrus fruits succeed so remarkably well in many parts of the State. Given suitable conditions, lemons can be produced in almost any portion of Victoria, from Orbost to Mildura; while, in the warmer parts, oranges are equally successful. Orange and lemon groves are in existence in all parts of Victoria, particularly in the northern areas. The yield from these during 1910 was only 51,130 bushels; and if it is possible to produce this quantity, there is surely room for extension in citrus culture, when we consumed last year over 330,000 packages of imported citrus fruits. Further, there is probably a large field for a greater quantity of these fruits, seeing that we exported last year over

12,000 packages of oranges and lemons. An export market thus established, although only on a small scale, will probably be capable of greater expansion.

Owing to large areas of suitable land being thrown open for closer settlement in the northern parts of the State, and to the arrival, and expected further arrival, of immigrants, there are signs of great and

SECTION OF ORANGE TREE, MILDURA.

increased activity in orchard establishment, particularly in the direction of citrus culture; and the new settlers are being urged to plant citrus fruits wherever the land is suitable. When we seriously consider the figures quoted previously, it will be understood that this advice is not given without due consideration of our requirements in this direction. We are not

keeping pace with our demand, and in this instance Victorians are forced to provide a living for people of other States and countries to produce for us what we can readily grow ourselves.

THE SOIL.

The choice of a suitable soil for oranges and lemons should be the first care of all intending citrus growers. So much depends upon the right soil; and while these fruits will generally grow for a time at least wherever planted, yet they do not possess the power of adaptability in regard to soils, that other classes of fruit trees have. Two points for citrus soil must be insisted upon; first, perfect drainage, and second, friability of texture.

Whether the drainage be natural or artificial, and natural drainage is always to be preferred, this is the first consideration in selecting the site for a citrus grove. There must be no possibility of any stagnant or sour soil conditions at any time during the life of the tree. Such conditions will inevitably result in the setting in of one or more fungus diseases on the roots. For this purpose, it is preferable that the presence of a clay subsoil should be guarded against, unless the overlying soil is of such a depth that the roots do not penetrate into the clay to any extent. The subsoil should be physically of a naturally porous condition, and only such a subsoil will produce the best results, both of tree and fruit. If the trees are planted where clay subsoils exist, then these must be artificially drained, either by very deep subsoiling or by agricultural drains, or preferably by both.

The second condition, a friable soil, is also an essential one. A soil where the mechanical conditions are suitable, and in which the texture is loose and friable, approaching to a sandy nature, is the suitable soil for citrus trees. The soil may be granitic, alluvial, a sandy loam, or it may even be pure sand; any light loamy or sandy soil will carry the best oranges and lemons. Stiff clay soils, heavy basaltic soils, solid loamy soils, and shallow soils are all to be avoided. It is more important to have a friable soil than a rich soil; it is more profitable to have a free acting soil, than one rich in plant food; although a fair proportion of vegetable humus is always desirable.

The sand hills on the banks of the Murray and its tributaries, the pine rises and ridges in the Goulburn Valley and in the Mallee, the alluvial valleys on the river banks, and between the ranges, in the North-Eastern district, are all eminently suitable for the cultivation of citrus fruits. Some of the finest oranges ever produced in Victoria were grown on almost pure sand, on one of the sand hills on the Murray banks near Cobram. In one season, oranges of the Washington Navel variety were grown weighing 19 ozs. and 21 ozs. each. In every way they were perfect specimens. While, therefore, a good or even rich soil is not to be despised for citrus culture, a perfect mechanical condition of both soil and subsoil is more to be desired. A poor soil carrying such requirements is better than a rich heavy and undrained one; and if it be possible to establish the citrus grove in land that does not require subsoiling, the results will be successful and payable.

PREPARATION OF SOIL.

All tree stumps and roots should be taken out of the citrus site. These are a very fertile factor for the dissemination of several fungus diseases.

The soil should then be ploughed, and, if possible, it should be left in a rough condition, so that it may be sweetened by exposure to the atmosphere. It is not advisable to plough too deeply, if the soil be shallow. If the surface soil be of good depth, then it may be turned over to a depth of 8 inches or 9 inches. A subsequent deeper cross ploughing to the depth of 12 inches will be beneficial, as the object of the cultivator should be to get the land worked up into as loose and friable a condition as possible. Thorough preparation for planting is a great aid to future success. Thoroughly friable soil will induce deeper rooting, which is a great necessity in citrus trees.

Orange and lemon trees are far more liable to fungus troubles than are other classes of fruiting trees; hence it is necessary that they should be planted in a thoroughly aerated and sweetened soil, and that these desirable conditions should be permanently maintained.

PLANTING AND CARE OF YOUNG TREES.

When the soil is in a satisfactory condition, the planting may be proceeded with. The season for planting is still a much debated subject. As citrus trees produce their main crops at a time when other trees are dormant, it is to be assumed that reversal of the time of planting is necessary. Therefore, growers have been advised by some to plant in early autumn; by others, in spring; and, by others, in summer. One point is certain—the soil must be warm for the reception of the young trees; this is to impel quick rooting.

The young trees must be planted at the same time, relatively, as other varieties of trees are planted; that is, during their period of dormancy, and shortly previous to the bursting into growth of the new buds. They *should be planted just previous to the "spring" season of the trees.* The adaptability of citrus trees to alteration of conditions is very great, and they will generally grow whether planted in the spring or in the autumn; but they should be planted when they will receive the least check. Further, after planting, if planted in their "springtime," they will put forth their young growths of foliage and probably flowers; and so they should be planted so that these new growths will have time to ripen and harden, before the rigours of winter and the ravages of frost can affect them. Therefore, as soon as the soil is warm in the spring time, planting may be proceeded with. October is generally a good month to do this work. The soil is fairly warm, and the young trees have plenty of time to put forth new roots and thus take hold of the soil before the succeeding winter. If autumn planting be carried out, the soil is warm enough, but the trees do not get sufficient roothold before the cold weather sets in. Citrus trees may be planted at any time from October to March; but best results will follow from late spring planting.

The trees should not be planted too closely; the roots travel laterally to a considerable degree, and the roots are also mainly surface feeders. Hence, too much crowding will weaken the trees, and will necessitate heavy manuring in after years. Close planting also prevents, to a great degree, a good circulation of atmosphere, which is a prime requisite, citrus trees being evergreen. A distance of 30 feet each way is quite close enough for all varieties of oranges. They may be planted at distances of 25 feet or 26 feet, but no closer. Lemons, being of a more compact growth, may be planted from 20 feet to 25 feet apart.

The young trees will thrive better if received from the nursery and planted in a "balled" condition. That is, the tree is removed from the nursery bed with a good ball of soil, and packed in hessian or bagging. The ball is then placed in the holes, which have been prepared for their reception, and the soil is well filled around it, without disturbing any of the roots, and without breaking the ball. The soil is then settled with a good supply of water. There is no necessity to remove the canvas, beyond untying it from round the stem of the tree; it will soon decay in the soil. It is a help to the young roots when they commence their growth, to sprinkle a handful of bonedust in the hole, before placing the tree in position. If the trees are planted by this method, it will not be necessary to cut away any growth from the tops, unless any one branch is unduly prominent.

LISBON LEMON TREE AT BURNLEY HORTICULTURAL GARDENS.

A method of planting sometimes followed in California, and known as the "post-hole" method, is to bore holes with post-hole augers some distance into the soil, at the bottom of the ordinary tree holes. These are filled with well rotted leaf mould or peaty soil. It is supposed that the roots in seeking their food will grow downwards into these food reservoirs, and that deep rooting will be thereby induced.

Where a few trees only are planted, it is always a help to them, to occasionally sprinkle the foliage lightly with water in the early morning, and also in the evening, until they have a firm hold of the soil. Any weak tree, or one not growing as successfully as the others, may be helped

along in this way. A little help and care, when the trees are young, go a long way towards making a strong sturdy citrus grove; especially seeing that, as they are evergreen trees, there will be a great amount of weakening transpiration from the foliage every day.

Trees of the citrus family are very susceptible to frost, particularly when young; and, if the grove is planted in regions where frosts are at all frequent, it will be necessary to protect the young trees for two or three seasons in frosty weather, with canvas or bagging. One severe frost will kill a young tree, and it is very necessary to take all precautions to prevent the tree being burned or checked in any way by frosts. Evergreen trees, when planted out in spring or summer, require far more watchful care and attention than do deciduous trees which are planted in the winter. A good watchful oversight of the young plantation, helping on any weaklings by syringing with water in warm weather, hoeing the surface soil, an occasional watering, or pinching back unduly prominent growths, according to the want of the young tree, will repay the operator handsomely, and with good success.

The question of inter-crops has now to be considered. It will probably be desired that the land shall be immediately reproductive, the planter not wishing to wait for revenue until the grove comes into bearing. A system of planting other crops between the rows may be judiciously carried out; and while the inter-crop will bring in an immediate result, the work may be done so as to help and improve the plantation. For the first year, the inter-crop may be kept only a few feet away from the young trees, but the distance must be increased as time advances.

The soil must always be kept well stirred; cultivation must be as complete as if there were no inter-crop, and all weeds should be rigorously excluded. The cultivation, as well as the manuring of the inter-crop, will be of great value to the soil. The kind of crop thus grown will be dependent upon the season. All classes of vegetables may be used as inter-crops; tomatoes, onions, potatoes, &c., all do well. Strawberries, gooseberries, and currants are also payable fruits to grow, provided the climate is suitable. Pumpkins, beans, peas, cabbages, cauliflowers, lettuces, and melons may be utilized, if the soil and the markets are satisfactory. A good payable winter crop could be grown from rhubarb. The refuse of these crops will be very valuable as future food for the trees if it be dug into the soil.

CULTIVATION AND IRRIGATION.

Trees of the citrus family are generally shallow rooters or surface feeders; hence, it was urged that, before planting, the soil be well worked and re-worked, so as to assist deep rooting. In cultivating the surface after planting, it will be a matter of urgency that as little damage as possible be done to the root system. Some growers prefer to carry on without any cultivation system at all, merely harrowing the surface lightly, and top-dressing the grove with fresh soil each year. This system will not become universal, as fresh soil is generally most difficult to obtain, still, where possible, it is a most excellent method of renovating and improving citrus soil. Sand dressings are also advantageous; and gutter or creek sand, or any washed sand, will always tend to improve the soil, lightening and opening its texture. Surface cultivation, in the absence of these systems, will always be a necessity; but, whatever method be adopted, the roots must not be cut or mutilated.

Light scarifyings and harrowings are all that will be necessary—a constant state of looseness must be maintained. If ploughing is resorted to, as a matter of urgency, then shallow ploughing must be the rule. In fairly heavy or in heavy loam soils, ploughing should always be practised after irrigation. The spreading of a body of water over the soil tends to consolidate the soil particles; and, in such soils, ploughing must quickly follow a watering.

The most suitable system of irrigation for citrus plantations is what is known as the furrow system. The water is not allowed to spread over the whole surface area, but is confined to two or three furrows between the rows, being allowed to run slowly through the soil. By this means, the greater part of the surface is kept loose, and frequently it is quite dry. The furrows should be of a reasonable depth so as to prevent overflow. This method is to be commended as far superior to the flooding system. The latter style is wasteful, the water not being properly concentrated; besides, it is frequently deceptive, *e.g.*, when a fair amount of water is given as a flooding, it may appear to be of a far greater quantity than it really is, and probably the soakage has not extended to any great depth at all. By the flooding system, there is a far greater amount of water lost by evaporation in the summer time, both while the water is on the ground and afterwards while the soil is drying sufficiently to allow cultivation to be proceeded with, and subsequent cultivation is made much more difficult.

The young trees may be irrigated within a fortnight of planting; subsequent waterings will depend on various circumstances, such as the season, age of plantation, the climate, and the soil. A young citrus grove will, in the summer, need frequent waterings in small quantities; whenever the trees show any signs of flagging or wilting, they must be watered. During a hot dry spell they will need a good supply of water; during cool weather the water may be withheld, and the surface stirred instead. In older plantations, four waterings each year should be ample; indeed, in some seasons, this would be an excess quantity.

Mulching is helpful to trees of this class; a good straw, grass, leaf, or even well rotted stable manure mulch, provided it be not heaped around the trunk of the tree, will always be useful; and it will obviate a considerable amount of digging and consequent root injury. If any hand work is resorted to, the fork should always be used in preference to any other tool, particularly when cultivating near the tree itself. Keep the land well stirred, and never allow the formation of a hard crust.

MANURING.

It has previously been stated that citrus trees prefer a loose soil to a rich one, but that richness and looseness form a good combination. Still, these trees will grow, and thrive very well in pure sand. When the soil is poor in quality, feeding to a limited extent will always be helpful to the trees. But, as a rule, manuring will not need to be resorted to for a few years, or until the trees come into general bearing. It has been estimated that oranges and lemons remove largely from the soil, potash and nitrogen, especially the latter, and a small quantity of phosphoric acid.

A good chemical fertilizer would be made up of 2 lb. bonedust, 1¼ lb. sulphate of potash, and ¾ lb. superphosphate to each tree, increasing the quantity proportionately with the age of the tree. Care must be taken

not to give an excess of potash, as that manure given in excess tends to thicken and toughen the rind, as well as to increase the acid quality of the fruit. Nitrogen is the greatest necessity of citrus trees, and a cover crop of some leguminous plant will always benefit the citrus orchard.

Well rotted stable manure is always valuable and helpful, particularly if it is collected and stored so as to retain the urine as well as the solid manure. In sandy soils, stable manure, by adding humus to the general mass, is probably the best manure. As a stimulant, nothing is more successful than sulphate of iron, applied at the rate of from 1 lb. to 2 lbs. per tree. It may be dissolved in 10 gallons of water, and thus fed to the roots, or it may be scattered broadcast between the trees before an irrigation, subsequently ploughing or cultivating the soil. A top dressing with new soil, sand, leaf mould, gutter or drain washings, and vegetable refuse matter of any kind will always be helpful as plant food in the citrus plantation.

(To be continued.)

SPRAYING FOR IRISH BLIGHT.

D. McAlpine, Vegetable Pathologist.

The efficacy of spraying is no longer called in question by any one who has given it a fair trial, but for those who have lost their potato crops during the past season, the following facts should convince them that it pays to spray, apart altogether from the increased yields.

In the minds of many, the weather is the controlling factor; but, during this season, which has been the worst on record for the encouragement of fungus diseases, the results obtained both with "Black Spot" of the apple and "Irish Blight" of the potato, proved conclusively that spraying done thoroughly at the proper time and with the proper mixture saves the crop in spite of the weather.

1. The following letter has just been received by the Department from a large potato-grower:—

Adverting to our previous correspondence, I desire to say that I sprayed my potatoes again about the beginning of March, and, although I have blight on my farm, the sprayed potatoes are remarkably free from it. I have just dug 100 bags, and there was not 1 per cent. infected; another paddock sprayed twice is practically clean, and a strip not five chains away—a few rows that I did not spray—is completely rotten.

The disease in this district is in a most virulent form: a series of hot, misty muggy spells made a heart-breaking mess of things. The disease appeared simultaneously over a very large area, hardly missing a farm, and leaving ruin everywhere. I used a 2 per cent. solution of bluestone with soda and a high-pressure—140 lbs. to the square inch—to which I attribute my success. I do not think the last word has been said in the matter of spray pumps. The pumps driven off the axle seem to lack the necessary power, and I consider a motor an essential. Spraying has failed in a good many instances here, but I know a good many have only sprayed as a matter of form. It does not seem any good monkeying with Irish Blight. It is a most insidious foe, and we must fight it with the gloves off, but I have seen enough to convince me that Bordeaux—if applied strong enough, and with sufficient force—will, at least, take the sting out of it. Personally, I would like to see spraying made compulsory, but I do not see how it could be done very well.

2. The good effects of spraying, even when done rather late in the season, was shown in the experimental plots at Kardella conducted by the Department. Over one acre of newly broken up land was planted with seed potatoes which had been sent to the destructor, and were very badly

blighted indeed. It was originally intended to spray a few rows with the copper-soda mixture, but it rained so heavily on the date of our visit that it had to be abandoned.

However, on 6th March, two rows were sprayed when the tops were badly blighted but still partially green, mainly to see the effect of the spray on the foliage. It rained heavily just before the spray was applied.

About a month afterwards (4th April), the potatoes were ready for digging, and the sprayed rows were conspicuous for the greenness of their foliage, while the others were brown and withered. The spray was in many instances still visible on the leaves, although a considerable amount of rain had fallen since the time of application. On digging the potatoes, the healthy and diseased were carefully weighed and the result was that, while 92 per cent. of the unsprayed were blighted, there were only 55 per cent. of those that were sprayed. This was the best yield in the district, notwithstanding that the "seed" was of such a nature that no one would ever dream of planting it, except for experimental purposes, and the neighbouring farmers who were present at the digging all went away fully convinced of the virtue of spraying.

3. It is not surprising, therefore, to find that the practice of spraying is becoming more and more common as its advantages are realized, and even in Ireland the latest *official* report states:—

Some idea of the recent progress made in this matter of spraying may be gained from the fact that, during the last three years, nearly 4,000 spraying machines have been sold through the efforts of the Department in the congested districts of the West of Ireland alone.

TOMATOES AND IRISH BLIGHT.

D. McAlpine, Vegetable Pathologist.

The tomato is so closely related to the potato-plant, as I have shown in the *Journal* for April, 1910, that potatoes and tomatoes may be produced on the same plant. A tomato shoot may be grafted on to a potato haulm, and there will be tomatoes above ground and potatoes underground. Conversely, if a potato stem is grafted on to a tomato shoot, there will only be tubers borne in the axils of the leaves. It was to be expected, therefore, that sooner or later, as in other parts of the world, the disease of Irish Blight would be found attacking the tomato crop in Australia. It has already been found in tomatoes imported into Victoria from New South Wales, as recorded in this *Journal* for January, 1910, also in Queensland, as noted in the Annual Report, 1909-10, but I have just found it (April) for the first time on plants grown in Victoria.

A row of tomatoes, containing about 150 vines, was planted alongside potatoes in the Yannathan district, the seed potatoes and the young tomato plants being planted at the same time—on 27th December, 1910. About 11th March the potato tops began to show signs of disease, and in about a week they all collapsed with Irish Blight. A few days after the potato plants had succumbed, the disease was noticed in the tomatoes when the fruit was forming. When I examined the plot on 6th April not a single plant had escaped, and only an occasional ripe and healthy tomato could be found, and it was evident that the tomatoes had been infected from the adjoining potatoes. The tomato plants were still green and flowering, but the lower leaves were often brownish and withered. A careful examination only revealed the presence of Early Blight on the leaves, so that although the fungus of Irish Blight may appear on the leaves and stems of the tomato plant, just as in the case of the potato, it only

affected the fruits at this stage. The fruits were the first portions of the plant to be attacked by the wind-borne spores. Tomatoes were found affected at all stages of growth, from the tiny fruit not the size of a pea, to the full-grown and large-sized lobed fruit. The symptoms are generally well-marked. There is a brownish discolouration, at first in patches, with a tendency to become mottled; and, when the fruit is sliced, this is seen to be due to the discolouration of the pulp extending more or less throughout.

A very simple way in which artificial infection may be brought about, is to place sporangia in a small phial of water. After being well shaken, a drop is placed on the skin of the potato or tomato, and a cut or stab made through the drop into the skin. Twenty healthy potatoes were infected at the same time in this way, and all became diseased, every one showing signs of it in about seven days. When the skin is unbroken there is not the same certainty of infection.

After the discovery of blighted tomatoes in Victoria, plenty of fresh spores were available, and an experiment was carried out to test the mutual infection of spores from potato and tomato under exactly similar conditions, when applied to the unbroken and broken skin. In each case there was only a single point of infection, and each specimen was placed by itself in a closed jar lined with moist blotting-paper, on 10th April, 1911.

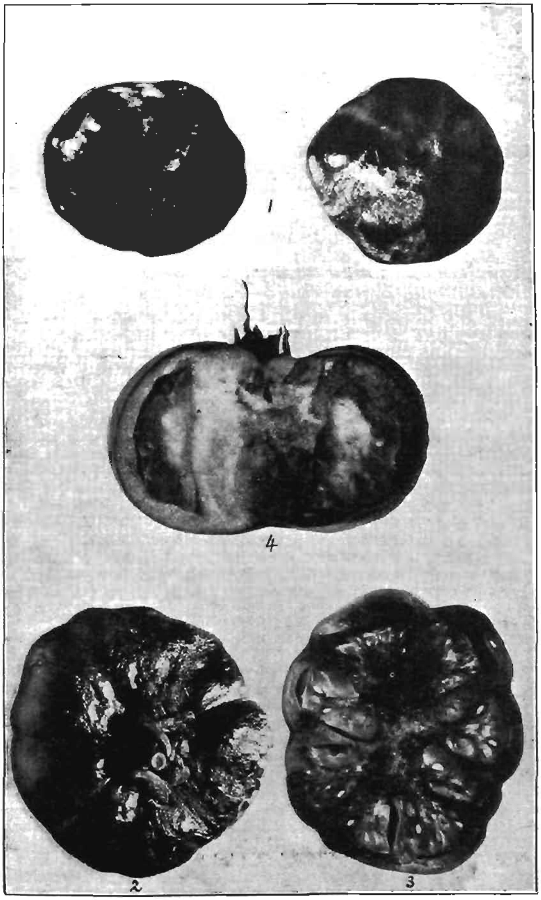
No.	Specimen.	Condition.	Infection.	Time taken to reproduce Spores.
1	Healthy Tomato	Unbroken skin	Spores from Tomato	14 days
2	.. ..	.. ..	.. Potato ..	No infection (16 days in previous experiment)
3	.. ..	Broken skin ..	.. Tomato	9 days
4	.. ..	.. .. ..	.. Potato ..	9 days
5	Healthy Potato (Carman No. 3)	Unbroken skin	.. .. ..	No infection (16 days in previous experiment)
6	Healthy Potato	.. ..	.. Tomato	9 days
7	.. ..	Broken skin ..	.. Potato ..	9 days
8	.. ..	.. .. ..	.. Tomato	9 days

One of the healthy tomatoes and potatoes was kept separately under moist conditions, without any development of disease. In nine days, two of the tomatoes and two of the potatoes with broken skin, as well as one of the potatoes with unbroken skin, produced the fructification of the Irish Blight fungus. At the end of fourteen days, a tomato with unbroken skin also produced the fructification, but no further developments were observed at the end of a month, and the experiment was considered closed.

Thus, a tomato and a potato with unbroken skin, inoculated with spores from a potato, were not infected, owing to some individual peculiarity, but in a previous experiment this infection was successful, and the fructification of the fungus appeared in both instances in sixteen days. Appended is a short account of the behaviour of each specimen.

EXPLANATION OF PLATE.

Fig. 1.—Two tomatoes from Yannathan, taken from the field, and showing luxuriant fructification on unbroken skin.
Fig. 2.—First specimen of blighted tomato obtained in Victoria.
Fig. 3.—Cross section of tomato, showing browning of tissue extending from outside inwards, and producing sporangia in fruit cavities.
Fig. 4.—Section lengthwise of tomato from Gelliondale, showing browning of tissue extending from circumference.



TOMATOES WITH IRISH BLIGHT.

No. 1 showed a depressed area of about three-quarters of an inch on the third day, and on the fourteenth day this had increased to fully one inch in diameter, but without any noticeable discolouration, and on the margin a few tufts of the fructification appeared. At the end of the experiment, the tomato became soft and rotten, and the diseased patch was overgrown with Fusarium.

No. 2 was still firm and showed no trace of disease.

No. 3 showed a small depressed area at infection point in three days, and on the ninth day the slightly discoloured and softened area was about 1½ inch in circumference, and distinctly marked off from the sound tissue. Tufts of sporangia had burst through the skin over the discoloured area, and even beyond it. At the end of the experiment, the specimen was completely rotten.

No. 4 was similar to the preceding, and the origin of the spores from the potato did not seem to affect the result. It was completely rotten and covered with a thick felt of Fusarium.

No. 5.—The potato remained quite firm and free from disease.

No. 6.—There was no sign of infection on the third day, but on the ninth day there was slight discolouration over a circular area of about half-an-inch in diameter, and tufts of sporangia were seen bursting through the lenticels, even beyond the discoloured portion. At the end, the entire potato was invaded by the fungus, and tufts of sporangia were produced all over the surface.

No. 7.—This specimen showed discolouration on the ninth day over an area of about 2 inches in diameter, and the fructification had burst through over and beyond this. At the end, the infection had extended over three-fourths of the area of the potato, and there were two strong apparently healthy shoots and a few smaller ones at the crown end. This was considered a very suitable sample for testing the assertion that the produce of a diseased tuber is not diseased, and it has been planted whole.

No. 8 was similar to the preceding up till the ninth day, and both showed a slight discolouration on the third day after infection. At the end, infection extended all over and tufts of sporangia were produced very generally over the entire surface.

It has now been conclusively shown that tomatoes and potatoes are mutually infective and that, even with the tough skin unbroken, spores falling upon them when moist, can produce infection, and a fresh crop of spores may appear within nine days.

A diseased tomato, like a diseased potato, may naturally produce spores on the unbroken surface while still attached to the parent plant, the fungus filaments protruding through the skin in both cases. But the tomato differs in producing spores internally as well, for the filaments of the fungus ramifying in the pulp bear spores freely in the cavities of the fruit containing the seeds.

It is evidently bad policy to plant tomatoes and potatoes side by side, as is often done in our coastal districts, for there is always a risk of one infecting the other, and consequently both crops may suffer. Further, the tomatoes growing in the winter have been known to be affected with blight, and thus the spores may be carried to the young potato crop, and from the potato to the tomato for one-half of the year at least; until the dry heat of summer arrives to hold them in check.

VERNACULAR NAMES OF VICTORIAN PLANTS.

The following list of provisionally adopted vernacular plant names, representing about one-third of the whole Victorian Flora, is only part of the work done by the Plant Names Committee since its appointment in August, 1907. It is now published here so that it may be the subject of general criticism prior to the final adoption of the complete list. Of the plants contained in the other two-thirds of the Flora, already about half have also been fitted with "common" names, and in the interim the remainder will be dealt with as speedily as possible, and in due course will, it is hoped, be presented for similar criticism in two separate lists.

It seems hardly necessary at this stage to contend that popular, common or vernacular names are really necessary or desirable for our plants. Some few there are who still remain doubtful in the matter. It is recognised, however, that a great many scientific names are found by most people exceedingly difficult to get hold of and difficult to keep in memory and still more difficult to write. It is obvious also that many of the names are merely labels, entirely lacking in suggestiveness; that indeed they were never intended to indicate any particular feature by which the plant might be distinguished. In some cases even, it may be said that the names, since the discovery of allied species, have become actually misleading. This being so, good vernacular names must surely be better for general use than indifferent, bad, or repellant scientific names, and the possession by each plant of one fixed, authoritative English name, as fitting as possible, must be welcomed by plant lovers and others and will undoubtedly lead to a greater general interest in our plants.

It is, of course, not imagined that nearly all the following names will meet with general approval. Some are admitted to be unsatisfactory, but for the time they are the best available, and are only put out tentatively and in the hope that others more fitting may be suggested. The Committee will be pleased to receive any criticisms and useful suggestions.

For the guidance of such as may feel disposed to offer names instead of those they disapprove of, some indication may be briefly given concerning the Committee's way of working. In dealing with each plant or plant group (genus, &c.), naturally the first question is, has the plant or group a name already? If so, and the plant also occurs or the group is represented in Great Britain, America or elsewhere, the name (or one of them) is in the great majority of cases retained. If the plant or group is endemic, the name most appropriate is chosen or perhaps varied, always supposing it is not the scientific name of a different group. As far as possible all the members of a group are given the same substantive name.

Sometimes if in popular use and sometimes, when short and euphonious, even if it is not in popular use, the scientific generic name is retained. Occasionally, too, the aboriginal (native) name is adopted. Only in the case of the popular name being out of the question or incapable of improvement or where none at all is discoverable, is the Committee driven to invent one. In many cases it does so by simply translating the scientific name, but otherwise it has regard primarily to the leading features of the plant or group, perhaps to the locality of its occurrence or to its affinities with other plants more or less removed from it. Always it endeavours to create a name as short, well sounding, and suggestive as possible.

Recognising that many of our plants occur also in other States, efforts have been made to enlist the sympathy and co-operation of the various

State botanists in our work, so that when finally adopted, the names may have the widest possible range. As matters stand at present the final list will, on receiving the approval of Mr. Maiden, the Government Botanist of New South Wales, Mr. Rodway, the Government Botanist of Tasmania, and Mr. Stoward, the Government Botanist of Western Australia, be published in full and have official recognition at least in Victoria, New South Wales, Tasmania, and West Australia, and perhaps in the remaining States also.

As this work is not being done by one individual but by a committee, it may perhaps be as well to state that the working committee by whom the final decisions are made is constituted as follows:—

Chairman: A. J. Ewart, D.Sc.; Ph.D.; F.L.S.
Hon. Secretary: C. S. Sutton, M.B., Ch.B.
Committee: Messrs. F. G. A. Barnard, G. Coghill, J. A. Leach, M.Sc., J. P. McLennan, F. Pitcher, P. R. H. St. John, and J. R. Tovey.

In addition, many valuable suggestions have been received from Messrs. J. H. Maiden, W. R. Guilfoyle, H. B. Williamson, L. Rodway, R. T. Baker, Maplestone, St. Eloy D'Alton, and A. R. Vroland, also from Dr. Morrison, the Rev. R. Thom, the late Mr. F. M. Reader, and from a large number of State school teachers.

Opportunity has been taken at the same time to include data, wherever such were available, in regard to any economic properties possessed by the native plants mentioned on the present list, as these data may prove to be of general use and may lead to further inquiry.

It will be noted that no great departures have been made from the system of naming and classification adopted by the late Baron von Müeller, since to have made all the changes that may ultimately prove necessary in the present list would have made it largely unintelligible to Victorian botanists and plant lovers.

MONOCOTYLEDONEÆ.

Botanical Name.	Popular Name.	Use or Character.
	EUCALYCEÆ PERIGYNÆ.	
ORCHIDEÆ.		
Dendrobium—		
speciosum, Smith ..	Common Rock Lily ..	Ornamental plant worthy of cultivation. The same applies to a greater or less extent to the whole of the following genera of orchids as far as *Prasophyllum*
striolatum, G. Reich. ..	Streaked Rock Lily	
Sarcochilus—		
falcatus, R.Br. ..	Sickle Sarcochilus	
parviflorus, Lindl. ..	Common Sarcochilus	
Dipodium—		
punctatum, R.Br. ..	Spotted Orchid	
Gastrodia—		
sesamoides, R.Br. ..	Potato Orchid	
Spiranthes—		
australis, Lindl. ..	Lady's Tresses	
Thelymitra—		
ixioides, Swartz. ..	Dotted Hood Orchid	
aristata, Lindl.	Tall Hood Orchid	
epipactoides, F.v.M. ..	Stout Hood Orchid	
longifolia, R. and G. Forster	Long-leaved Hood Orchid	
fusco-lutea, R.Br. ..	Blotched Hood Orchid	
carnea, R.Br.	Pink Hood Orchid	
flexuosa, Endl.	Twisting Hood Orchid	
antennifera, Hook. f. ..	Yellow Hood Orchid	
Macmillani, F.v.M. ..	Red Hood Orchid	

VERNACULAR NAMES OF VICTORIAN PLANTS—*continued.*

MONOCOTYLEDONEÆ—EUCALYCEÆ PERIGYNÆ—*continued.*

Botanical Name.	Popular Name.	Use or Character.
ORCHIDEÆ—*continued.*		
Diuris—		
alba, R.Br.	White Diuris	
punctata, Smith	Purple Diuris	
palustris, Lindl.	Swamp Diuris	
maculata, Smith	Leopard Orchid	
pedunculata, R.Br.	*Snake Orchid*	
sulphurea, R.Br.	Tiger Orchid	
longifolia, R.Br.	Tall Diuris	
Orthoceras—		
strictum, R.Br.	Crow Orchid	
Calochilus—		
campestre, R.Br.	Satyr Orchid	
Robertsoni, Benth.	Brown Beards	
Cryptostylis—		
longifolia, R.Br.	Long-leaved Duck Orchid	
leptochila, F.v.M.	Thin-lipped Duck Orchid	
Prasophyllum—		
australe, R.Br.	Austral Leek Orchid	The flowers are too small and monotonous in colour to be of any appreciable decorative value, and the plants have no fodder value, and, so far as is known, have no economic importance
elatum, R.Br.	Tall Leek Orchid	
Frenchii, F.v.M.	Stout Leek Orchid	
brevilabre, Hook. f.	Short-lipped Leek Orchid	
patens, R.Br.	Pale Leek Orchid	
fuscum, R.Br.	Tawny Leek Orchid	
Reichenbachii, F.v.M.	Dense Leek Orchid	
nigricans, R.Br.	Dark Leek Orchid	
rufum, R.Br.	*Red Leek Orchid*	
brachystachyum, Lindl.	Desert Leek Orchid	
despectans, Hook. f.	Tiny Leek Orchid	
fimbriatum, R.Br.	Fringed Leek Orchid	
Archeri, Hook. f.	Archer Leek Orchid	
fuscoviride, Leader	Dusky Leek Orchid	
Dixoni, F.v.M.	Dixon Leek Orchid	
intricatum, C. Stuart	Elfin Leek Orchid	
Microtis—		
porrifolia, R.Br.	Leek Microtis	Grows amongst grass, &c.; of no economic value
atrata, Lindl.	Tiny Microtis	
Corysanthes—		
unguiculata, R.Br.	Lesser Red Helmet	Grows in shady places; too small to be worthy of cultivation
pruinosa, R. Cunn.	Greater Red Helmet	
Pterostylis—		
concinna, R.Br.	Trim Green-hoods	Many of the larger flowered species of *Pterostylis*, as well as most of the *Orchideæ*, would look well in "wild" lawns and shrubberies. The flowers of *Pterostylis*, though without distinctive colours, are curious in shape
curta, R.Br.	*Blunt Green-hoods*	
Mackibboni, F.v.M.	Short Green-hoods	
acuminata, R.Br.	Pointed Green-hoods	
nutans, R.Br.	Nodding Green-hoods	
pedaloglossa, Fitzg.	Tailed Green-hoods	
pedunculata, R.Br.	Maroon-hoods	
nana, R.Br.	Dwarf Green-hoods	
cucullata, R.Br.	Leafy Green-hoods	
furcata, Lindl.	Forked Green-hoods	
grandiflora, R.Br.	Large Green-hoods	
reflexa, R.Br.	Striped Green-hoods	Grow in shady places, under Tea Tree and other vegetation, as also do other species
reflexa, var. præcox (præcox, Lindl.)	Early Green-hoods	
obtusa, R.Br.	Slender Green-hoods	
parviflora, R.Br.	Tiny Green-hoods	
barbata, Lindl.	Bearded Green-hoods	
mutica, R.Br.	Small Green-hoods	
rufa, R.Br.	Rusty-hoods	
longifolia, R.Br.	Tall Green-hoods	
vittata, Lindl.	Banded Green-hoods	
Caleya—		
major, R.Br.	Cockatoo Orchid	Possibly worthy of cultivation as garden novelties
minor, R.Br.	*Small Cockatoo Orchid*	
Sullivani, F.v.M.	Spectral Cockatoo Orchid	
Drakœa—		
irritabilis, G. Reich.	Hammer Orchid	
Acianthus—		
caudatus, R.Br.	Tailed Gnat Orchid	Usually grows in alpine districts
exsertus, R.Br.	Common Gnat Orchid	Grows in damp shady places under shrubs, &c.

VERNACULAR NAMES OF VICTORIAN PLANTS—*continued.*

Botanical Name.	Popular Name.	Use or Character.
MONOCOTYLEDONEÆ—EUCALYCEÆ PERIGYNÆ—*continued.*		
ORCHIDEÆ—*continued.*		
Cyrtostylis—		
reniformis, R.Br. ..	Mosquito Orchid ..	Possibly worthy of cultivation as garden novelties
Lyperanthus—		
suaveolens, G. Reich. ..	*Scented Lyperanth* ..	
nigricans, R.Br... ..	Flower of Sadness ..	
Burnettia—		
cuneata, Lindl.	Wedge-leaved Burnettia ..	
Eriochilus—		
autumnalis, R.Br. ..	Autumn Orchid ..	
Caladenia—		
fimbriata, G. Reich. ..	Fringed Caladenia ..	The whole of the species of this genus are especially worthy of cultivation in gardens, *C. Patersoni* for its shape, and the last four species on the list for their colour
Menziesii, R.Br. ..	Hare Orchid	
Cairnsiana, F.v.M. ..	Small Spider Orchid ..	
discoidea, Lindl. ..	Broad-lipped Spider Orchid	
filamentosa, R.Br. ..	Tailed Caladenia ..	
Patersoni, R.Br. ..	Common Spider Orchid ..	
latifolia, R.Br.	Pink Fairies	
carnea, R.Br.	Pink Fingers	
congesta, R.Br. ..	Slender Caladenia ..	
cœrulea, R.Br.	Blue Caladenia	
deformis, R.Br. ..	Blue Fairies	
Chiloglottis—		
diphylla, R.Br.	Twin-leaved Bird Orchid ..	No known economic value
Gunnii, Lindl.	Common Bird Orchid ..	
Glossodia—		
major, R.Br.	Larger Glossodia ..	Large blue flowered spring orchid, worthy of cultivation
minor, R.Br.	Smaller Glossodia ..	Similar to *G. major*, but smaller
IRIDEÆ.		
Diplarrhena—		
Moraea, Labill.	Butterfly Iris	The white flowers of Diplarthena and the purple ones of Patersonia, though handsome, do not surpass the garden Iris
Patersonia—		
glauca, R.Br.	Short Purple Flag ..	
longiscapa, Sweet ..	Long Purple Flag ..	
sericea, R.Br.	Silky Purple Flag ..	
glabrata, R.Br.	Leafy Purple Flag ..	
Sisyrinchium—		
paniculatum, R.Br. ..	Branching Grass Iris ..	Usually grow in moist situations; have a scouring effect on stock
pulchellum, R.Br. ..	Pretty Grass Iris ..	
cyaneum, Lindl. ..	Blue Grass Iris	
HYDROCHARIDEÆ.		
Halophila—		
ovata, Gaudich... ..	Sea Wrack	Grows around sea coast; no known economic value
Ottelia—		
ovalifolia, L. C. Richard	Ottelia..	Floating or submerged plants; no known economic value. *V. spiralis* is a suitable plant for indoor aquaria
Vallisneria—		
spiralis, L.	Vallisneria	
Elodea (*Hydrilla*)—		
verticillata, F.v.M. ..	Elodea..	
AMARYLLIDEÆ.		
Hypoxis—		
hygrometrica, Labill. ..	Golden Weatherglass ..	Grow in wet or damp situations
glabella, R.Br.	Yellow Stars	
Crinum—		
flaccidum, Herbert ..	Murray Lily	Decorative plant; has no other known economic value
Calostemma—		
purpureum, R.Br. ..	Garland Lily	No known economic value

VERNACULAR NAMES OF VICTORIAN PLANTS—*continued.*

MONOCOTYLEDONEÆ—(*continued*)—EUCALYCEÆ HYPOGYNÆ.

Botanical Name.	Popular Name.	Use or Character.
LILIACEÆ.		
Smilax—		
glycyphylla, Smith ..	Smooth Sarsaparilla ..	This plant has been recommended as an alterative, tonic, and anti-scorbutic
australis, R.Br.	Prickly Sarsaparilla ..	No known economic value
Rhipogonum—		
album, R.Br.	Lawyers	
Drymophila—		
cyanocarpa, R.Br. ..	Turquoise Berry .	
Dianella—		
tasmanica, Hook. f. ..	Tasman Flax Lily	
longifolia, R.Br. ..	Long-leaved Flax Lily ..	The fibre of this plant was formerly used by the aborigines for making baskets
revoluta, R.Br.	Spreading Flax Lily ..	The Dianellas produce a fair fibre, which is obtained by boiling and scraping the leaves
Eustrephus—		
Brownii, F.v.M.	*Wombat Berry*	No known economic value
Geitonoplesium—		
cymosum, Cunn. ..	Scrambling Lily ..	
Astelia—		
alpina, R.Br.	Astelia..	Usually grows in alpine localities; no known economic value. Fruit edible
Anguillaria—		
dioica, R.Br.	Early Nancy	Rather pretty plant, which flowers profusely in early spring
Schelhammera—		
undulata, R.Br.	Lilac Lily	Possibly worthy of cultivation in gardens
Burchardia—		
umbellata, R.Br. ..	Milkmaids .. .	
Bulbine—		
bulbosa, Haworth ..	Common Yellow Lily .	A supposed poison plant. The "poisonous" effect appears to be the result of scouring
semibarbata, Haworth ..	Smaller Yellow Lily ..	Somewhat similar to *B. bulbosa*
Thysanotus—		
tuberosus, R.Br. ..	Bulbous Fringe Lily ..	The flowers of all these species, though mostly rather small, are very beautiful. Many may ultimately find a home in gardens
Baueri, R.Br.	Common Fringe Lily .	
Patersoni, R.Br. ..	Twining Fringe Lily ..	
dichotomus, R.Br. ..	Branching Fringe Lily .	
Cæsia—		
vittata, R.Br.	Banded Grass Lily ..	
parviflora, R.Br. ..	Small-flowered Grass Lily	
Chamæscilla—		
corymbosa, F.v.M. ..	Blue Squill	
Corynotheca—		
lateriflora, F.v.M. ..	Sand Lily .. .	
Tricoryne—		
elatior, R.Br.	Yellow Autumn Lily ..	
simplex, R.Br.	Small Autumn Lily ..	
Stypandra—		
glauca, R.Br.	Nodding Blue Lily ..	
cæspitosa, R.Br. ..	Tufted Blue Lily ..	
Arthropodium—		
paniculatum, R.Br. ..	Pale Vanilla Lily ..	Hardy, herbaceous, perennial, ornamental plant; sometimes cultivated in gardens
minus, R.Br.	Small Vanilla Lily	
strictum, R.Br.	Large Vanilla Lily .	Ornamental plants: might be improved in cultivation
fimbriatum, R.Br. ..	Fringed Vanilla Lily ..	
Herpolirion—		
Novæ-Zelandiæ, Hook. f.	Sky Lily	No known economic value. *S. juncea* is ornamental, pleasantly scented, and worthy of cultivation
Sowerbæa—		
juncea, Smith	Rush Lily	
Laxmannia (*Bartlingia*)—		
gracilis, R.Br.	Silverweed Lily ..	
sessiliflora, Dene ..	Nodding Silverweed Lily ..	
Calectasia—		
cyanea, R.Br.	Blue Tinsel Lily ..	An ornamental plant; worthy of cultivation

VERNACULAR NAMES OF VICTORIAN PLANTS—*continued.*

Botanical Name.	Popular Name.	Use or Character.
MONOCOTYLEDONEÆ—EUCALYCEÆ HYPOGYNÆ—*continued.*		
LILIACEÆ—*continued.*		
Xerotes—		
dura, F.v.M.	*Hard Mat Rush*	Several of these plants may prove useful for weaving. *X. longifolia* furnishes a valuable pulp suitable for paper manufacture
longifolia, R.Br.	Long Mat Rush	
Brownii, F.v.M.	Brown Mat Rush	
sororia, F.v.M.	Small Mat Rush	
effusa, Lindl.	Scented Mat Rush	
micrantha, Endl.	Small-flowered Mat Rush	
Thunbergii, F.v.M.	Wattle Mat Rush	
glauca, R.Br.	Pale Mat Rush	
juncea, F.v.M.	Desert Mat Rush	
leucocephala, R.Br.	White Mat Rush	
Xanthorrhœa—		
hastilis, R.Br.	Spear Grass Tree	Contain a resin soluble in alcohol
minor, R.Br.	Small Grass Tree	
australis, R.Br.	Southern Grass Tree	
PALMÆ.		
Livistona—		
australis, Martius	Cabbage Tree Palm	The aborigines eat the centre or heart of this palm. The wood, or outer part of the stem, is moderately hard, and sometimes used for walking sticks. The leaves are used for making baskets
TYPHACEÆ.		
Typha—		
angustifolia, L.	Bulrush	The young shoots are edible; the pollen is used as food by the natives. The leaves are used for making mats in some parts of the world. The plant is not confined to Australia. Furnishes material for paper-making, and a fibre of fair strength
Sparganium—		
stenophyllum, Max.	Bur Reed	Has no special economic value: hungry stock will eat it, but it only grows in lakes, rivers, backwaters, or swampy places
LEMNACEÆ.		
Lemna—		
trisulca, L.	Ivy-leaved Duckweed	Water weeds of no known economic value
minor, L.	Lesser Duckweed	
oligorrhiza, Kurz.	Thin Duckweed	
polyrrhiza, L.	*Greater Duckweed*	
Wolfia—		
Michelii, Schl.	Tiny Duckweed	
NAIADACEÆ.		
Najas—		
tenuifolia, R.Br.	Water Nymph	
Lepilæna—		
australis, J. Drum.	Austral Water Mat	Grow in saline waters; of no known economic value
Preissii, F.v.M.	Slender Water Mat	
Cymodocea—		
zosterifolia, F.v.M.	Sea Nymph	Grows round the sea shore; of no known economic value
Zostera—		
nana, F. K. Mertens	Dwarf Grass Wrack	Saltwater plant: grows round the coast; Greedily eaten by cattle
tasmanica, G. v. Martens	Tasman Grass Wrack	Saltwater plants grow round the coast; no known economic value
marina, L.	Broad Grass Wrack	
Posidonia—		
australis, Hook. f.	Fibre-ball Weed	Marine submerged plant, deposits of which on coast of South Australia are being made use of for its fibre
Ruppia—		
maritima, L.	Sea Tassel	Marine submerged plant

VERNACULAR NAMES OF VICTORIAN PLANTS—*continued.*

MONOCOTYLEDONEÆ—EUCALYCEÆ HYPOGYNÆ—*continued.*

Botanical Name.	Popular Name.	Use or Character.
NAIADACEÆ—*continued*		
Potamogeton—		
sulcatus, A. Bennett ..	Furrowed Pond Weed ..	
natans, L.	*Floating Pond Weed* ..	
coloratus, Hornem. ..	Coloured Pond Weed ..	
polygonifolius, Pourret ..	Polygonum Pond Weed ..	
lucens, L.	Shining Pond Weed ..	
Cheesemanii, A. Bennett	*Maori Pond Weed* ..	*Troublesome water weeds; no known* economic value
perfoliatus, L.	Perfoliate Pond Weed ..	
crispus, L.	Curly Pond Weed ..	
obtusifolius, Mertens and Koch	Blunt Pond Weed ..	
acutifolius, Link. ..	Sharp Pond Weed ..	
pectinatus, L.	Fennel Pond Weed ..	
Triglochin—		
centrocarpa, Hook. ..	*Dwarf Arrow Grass* ..	*Weeds of water and wet places; no* known economic value, with the exception of the last species, which is sometimes eaten by stock
striata, Ruiz and Pavon ..	Streaked Arrow Grass ..	
mucronata, R.Br. ..	Prickly Arrow Grass ..	
procera, R.Br.	Giant Arrow Grass ..	
ALISMACEÆ.		
Alisma—		
Plantago, L.	Greater Water Plantain ..	Not poisonous, but not specially nutritious. *Stock will eat the leaves*
Damasonium—		
australe, Salisb. ..	Star Fruit	
PHILHYDREÆ.		
Philydrum—		
lanuginosum, Banks ..	Woolly Water Lily ..	No known economic value
XYRIDEÆ.		
Xyris—		
gracilis, R.Br.	Slender Flowering Rush ..	May possibly prove useful for mat weaving
operculata, Labill. ..	Tall Flowering Rush	
JUNCEÆ.		
Luzula—		
campestris, D.C. ..	Field Wood Rush ..	No known economic value
Juncus—		
planifolius, R.Br. ..	Broad-leaved Rush ..	Troublesome in moist lawns. The rushes are weeds of wet places; some are useful for weaving, others yield pith for making tallow dips. The softer ones are slightly browsed by stock, but none are good fodder plants. Their presence in a pasture indicates the need of drainage and manuring. The leaves of some of the species furnish good paper-making material and fibre of considerable strength
cæspititius, E. Meyer ..	Tufted Rush	
falcatus, E. Meyer ..	Sickle Rush	
bufonius, L.	Toad Rush	
homalocaulis, F.v.M. ..	Wiry Rush	
revolutus, R.Br. ..	Brown's Rush	
communis, E. Meyer ..	Common Rush	
Radula, Buch.	Scraper Rush	
pauciflorus, R.Br. ..	Few-flowered Rush ..	
pallidus, R.Br.	Pale Rush	
maritimus, Lamarck ..	Shore Rush	
prismatocarpus, R.Br. ..	Branching Rush ..	
stipulatus, Meyen and Nees	Small Rush	
acutus, L.	Stiff Rush	
capitatus, Weigel ..	Bunch Rush	A native of Europe and Africa; now naturalized in Victoria
ERIOCAULEÆ.		
Eriocaulon—		
Smithii, R.Br.	Common Pipewort ..	No known economic value
electrospermum, F.v.M. ..	Amberseed Pipewort ..	

VERNACULAR NAMES OF VICTORIAN PLANTS—*continued.*

Botanical Name.	Popular Name.	Use or Character.
MONOCOTYLEDONEÆ—EUCALYCEÆ HYPOGYNÆ—*continued.*		
CENTROLEPIDEÆ.		
Trithuria—		
submersa, Hook. f.	Trithuria	Small grass-like plants; no known economic value
Aphelia—		
gracilis, Sonder	Slender Aphelia	
Pumilio, F.v.M.	Dwarf Aphelia	
Centrolepis—		
polygyna, Heiron.	Mossy Centrolepis	
glabra, F.v.M.	Smooth Centrolepis	
cephaloformis, F. M. Reader	Cushion Centrolepis	
aristata, Roemer and Schult.	Pointed Centrolepis	
fascicularis, Labill.	Tufted Centrolepis	
strigosa, Roemer and Schult.	Hairy Centrolepis	
RESTIACEÆ.		
Lepyrodia—		
scariosa, R.Br.	Chaffy Scale Rush	Practically no fodder value; and, hitherto, with no known economic use. Some of the larger species might possibly prove useful for weaving or similar purposes
Muelleri, Benth.	Mueller Scale Rush	
tasmanica, Hook. f.	Tasman Scale Rush	
interrupta, F.v.M.	Interrupted Scale Rush	
Restio—		
australis, R.Br.	Austral Cord Rush	
gracilis, R.Br.	Slender Cord Rush	
complanatus, R.Br.	Flat Cord Rush	
tetraphyllus, Labill.	Tassel Cord Rush	
Hypolæna—		
lateriflorus, Benth.	Spreading Rope Rush	Useless as pasture plants; no known economic value
fastigiatus, R.Br.	Faded Rope Rush	
Leptocarpus—		
tenax, R.Br.	Tough Twine Rush	
Brownii, Hook. f.	Brown Twine Rush	
Lepidobolus—		
drapetocoleus, F.v.M.	Eastern Chaff Rush	

(*To be continued.*)

TOBACCO CULTURE.

(*Continued from page* 234.)

T. A. J. Smith, Tobacco Expert.

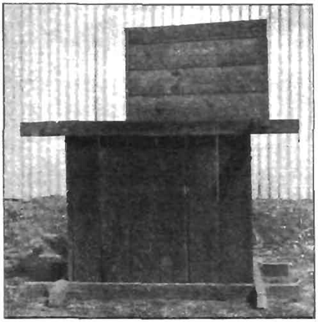
PACKING FOR MARKET.

After the fermentation or sweating process has taken place, the tobacco is generally allowed to remain in the bulk for ten or twelve days, or as much longer as is convenient, to admit of the evaporation of any surplus moisture. The colours will also become more uniform during this stage, and a greater degree of safety insured; as tobacco packed with too large a degree of moisture content is liable, when pressed, to become more or less mouldy during transit to market.

Ten to twelve per cent. of moisture is the maximum amount required for safety. This can be ascertained by carefully weighing 10 lbs. of the leaf as it is taken from the bulk, and drying this quantity right out in a slow oven until all the moisture is expelled. The parcel should be again weighed, the percentage being shown by the difference in the moist and dry weights. The leaf should not be packed when it is so dry as to

break with the pressure required for baling. If the bulk should have dried out so as to bring about such a condition, it should be covered with green maize or any other green crop available, or wet bags rung out so that no free water exists.

The floor of the shed should be kept moist, and the shed doors and ventilators closed, so that damp conditions are engendered. Being a great absorbent, the tobacco will then become sufficiently pliable to handle without damage. Some growers cover the floor of the shed with a layer of straw a few inches in thickness and water this well, bringing about the desired result. If this system is adopted, care must be taken not to let the straw get blown into the tobacco, as manufacturers strongly object to any foreign matter. If carefully watched, the tobacco can be packed in exactly the right condition without resorting to the above expedients. The bulk should be opened on the top, and not more than is necessary exposed as it is taken to the press to be baled, especially on a dry warm day. If the atmosphere is damp, this precaution is not necessary.



TOBACCO PRESS.

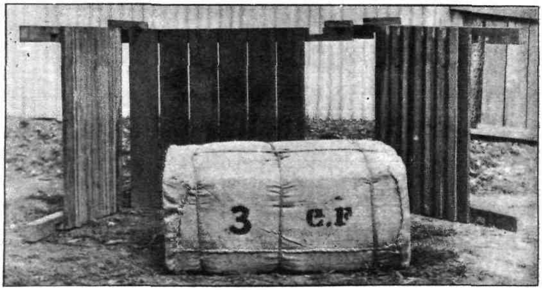
The prevailing custom in Victoria is to pack the tobacco in bales of hessian 3 ft. long, x 2 ft. wide, x 2 ft. high. The press can be made, on the premises, of either hard or soft wood, of 1-in. thickness, with 3 in. x 2 in. pieces of hardwood at the top and bottom of both sides and ends. These project 8 ins. beyond the sides and ends, and are so mortised as to fit into one another, making a box or press 3 ft. long x 2 ft. wide x 3 ft. high (inside measurements). Wedges of wood are then driven into the mortises to tighten the whole box which should be made floorless. The ends are improved by having 1-in. slats nailed from top to bottom 1¼ ins. apart on the inside.

One-half the width of ordinary hessian is spread on the floor of the shed, and the press placed upon this under the lever or screw. One man, in rubber shoes or stockinged feet, gets inside the press and the tobacco hands are brought to him to be placed with the butts between the slats on the end of the press, keeping all the tips of the leaves to the centre. The ends are filled alternately, and each layer pressed down with the feet until the box is filled to the top. If the tobacco is short, it will be found necessary to put a layer lengthways in the middle to secure even pressure, but ordinarily well grown leaf, which should average 2 ft. to 2 ft. 6 ins. in length, will not require any hands in the centre.

When the box is filled, a lid, which should be so constructed as to fit easily inside the box, is placed on it; and pressure is then applied by whatever means are available. The most popular, and the least expensive, is the lever, which is made of a sapling or piece of timber about

16 ft. in length. This is inserted in a post or stump about 6 ins. immediately over the press, blocks of wood are put on the lid of the press, and the whole is pressed down by weighting the far end of the lever with bags of sand, &c., until the tobacco is pressed to about 1 ft. in depth. The lever and lid are then removed and the box again filled to the top. The process is repeated two or three times; and, previous to the last pressure, a piece of hessian projecting 3 ins. on each side is placed under the lid as it is put on the filled box, and after the tobacco is pressed the lever is left on and the sides removed. The hessian on the ground is then brought up to the top and sewn with twine to the piece under the lid. The ends also should be sewn up, and haylashing is placed round the whole close to each end, and round the centre, and drawn tightly. It is also wise to rope round the bale longitudinally, where the tobacco has to be taken any distance.

Each bale should be branded with the grade of leaf contained, and also numbered as it is finished, so that any one can be selected if required for sampling or inspection. The bales should be stacked on a wooden floor or platform and kept square, exposing as little surface as possible, and covered with bags or hessian until sent to market. A bale should contain from 150 lbs. to 250 lbs.



BALED TOBACCO READY FOR MARKET.—OPENED PRESS AT BACK.

Where tobacco is prepared for export, packing in casks is preferable, the tobacco being less likely to become damaged or wasted. Each cask will hold from 1,200 lbs. to 1,800 lbs. of tobacco, the dimensions being 4 ft. 8 in. high, by 4 ft. diameter at the bottom and 3 ft. 6 in. on the top. When packing in the cask the smaller end is on the ground and the tobacco stacked in layers round the interior, the butts of the bundles or hands being kept to the outside and the middle well filled. Pressure is applied three times. The lid is forced down below the top about 3 ins. during the final pressure, and a hoop nailed round inside the top to keep it in place. The weight of the cask, including the lid and hoops, should be taken before commencing operations so that the exact tare can be estimated when weighing.

The object of having the cask bigger in diameter at one end is for the purpose of sampling. The outside hoops are cut on the larger ends and the cask lifted off the tobacco, when inspection is required. Casks

may be purchased for 5s. each and tobacco carefully packed in them can be sent to any part of the world without injury.

A lever press is not suited to the cask system, a screw or steam press being best for the purpose. The casks should of course be branded, as the bales are, with weight of tare in addition.

Heavy dark leaf will stand more pressure than bright, and very heavy pressing will have the effect of making bright leaf darker in colour, a result to be avoided.

Cigar leaf is usually packed in bales of jute or hessian, containing from 100 lbs. to 300 lbs., and sometimes in square boxes holding similar quantities. When it is intended to age cigar leaf, that is, to pack it away for twelve months or more, the box system is best. It is better not to have the box too closely built, so to allow of the easy escape of the gases which are thrown off during the process.

All tobacco is better for being aged and is said to improve in quality for six years, becoming milder and sweeter. After the sixth year deterioration takes place, especially in the lighter types of leaf.

In Victoria, very little tobacco is held by the growers for the purpose of ageing. The manufacturer, as a rule, buys from 12 to 24 months ahead of requirements. If it is found necessary to store, the tobacco must be kept under dry conditions, that is, well off the floor, and in a dark place for preference.

Freights on tobacco are low in proportion to its value per ton, consequently it is a suitable crop for land owners situated at long distances from a market.

Marketing.

A few hints on marketing tobacco leaf are, perhaps, necessary. In one case, the writer found that a grower, who had been cultivating tobacco for three years, had decided to abandon the crop as unprofitable on account of its being unsaleable. He had tried to sell his leaf to plug manufacturers, whereas he had been growing a fair sample of cigar tobacco. When properly placed, he received a cheque for nearly £200 for his product. Cigar leaf is of no use to plug men, and plug tobacco of little or no use to cigar men.

There is a good demand for Victorian plug leaf in Melbourne, Sydney, Adelaide, and Western Australia. In 1910, Victoria manufactured about 4,698,995 lbs. of plug tobacco, 220,000 lbs. of cigar leaf, and 306,000 lbs. of cigarette leaf, while only 309,000 lbs. of local leaf were produced. Local buyers are anxious to obtain larger supplies of the Victorian product, one Melbourne company alone being prepared to take 500 tons annually.

There need be no hesitation, therefore, in regard to the prospect of a demand for our leaf for some years to come. Not only is there ample room for expansion of the industry, so far as our home market is concerned, but even should we over-produce, there is a practically unlimited market in London for leaf of fair quality.

Values have been increasing steadily of late years, chiefly owing to the fact that the production of tobacco all over the world is not keeping pace with the increase in consumption. It was estimated recently in America that supplies had fallen 20 per cent. behind the demand. Manufacturers, both in England and America, complain that, owing to the short supplies, it is not possible to age the tobacco to the same extent as formerly. The prospect in a new country for a tobacco industry is therefore encouraging.

It must always be borne in mind, however, that popular tastes for tobacco incline to lighter types than previously; and, in order to obtain

these, lighter soils must be used for growing and the varieties suited to them adopted. There will naturally always be a certain amount of heavy tobacco smoked, but the tendency is towards the lighter kinds. In Victoria, we have soils and climate suited to many different types which will yet prove highly profitable.

(To be continued.)

VINE DISEASES IN FRANCE.

F. de Castella, Government Viticulturist.

In recent articles on the wine industry in Southern France we have seen what remarkable results are obtained from intense culture applied to the vine. Attention has been directed to the principal factors which contribute to the very heavy yields obtained, especially those of more direct interest from an Australian standpoint.

Remarkable though such yields would be under any circumstances, they become even more so when it is remembered that they are obtained in spite of difficulties such as we have little idea of in Victoria. Viticulture in France is an almost continual struggle against a variety of vine diseases, both fungus and insect, the majority of which are quite unknown to us; whilst those which we do know, attack the vines of France with a degree of virulence such as we are quite unaccustomed to in Victoria.

So far as vine diseases are concerned, we may truly be said to be the spoilt children of Nature. The spray pump, though in common use in our orchards, is not required in our vineyards, in which even the sulphur bellows has, within the past few years, at least, seldom been called into requisition. This season, certainly, there has been a re-appearance of an old enemy, in the shape of Oidium, which for a decade or so has been remarkably quiescent.

The rich harvest reaped in spite of these adverse contingencies, and after an almost continual and costly struggle, cannot fail to arouse a feeling of admiration for the perseverance of the French vigneron, as well as for the science of investigators who have placed in his hands the means of repairing the evils resulting from man's interference with the balance of Nature. The grave vine diseases which made their appearance in Europe during the past century are not, as has been so frequently stated, visitations of Nature, but introductions from North America.

Our freedom from the most serious fungus and insect diseases of the vine is an advantage as yet insufficiently recognised by us. It should awaken in us a sense of the remarkable suitability of this State of Victoria for vine culture, and enable us to realize the rich reward in store for those who tend their vines in as careful and thorough a manner as do Southern French vine-growers.

In the lines which follow it is intended to give some idea of the many difficulties the French vine-grower has to contend against. These remarks are not, like the preceding articles, limited to the department of Hérault—they apply to the whole of France. It is worthy of note, however, that the warmer southern parts are a good deal less subject to disease generally than the colder and moister regions. Nevertheless, even in Hérault, the treatment necessary to protect the vine from its many diseases constitutes a tax which is fortunately unknown to Australian growers.

FUNGUS DISEASES.

The fungus diseases which attack the vine in France may be divided into several categories. In the first place, we have the two which have long been known to us under the names of Oidium and Black Spot or Anthracnosis. Then there are others, fortunately unknown in Australia, such as Downy Mildew and Black Rot, which are, both as regards the ravages for which they are responsible and the costly sprayings necessary to keep them in check, the most serious obstacles against which the French vine-grower has to contend. Several others of minor importance also deserve mention, chief amongst which are White Rot, Grey Rot, Fumago, and several fungi which only exceptionally do damage of any consequence. Lastly, we have different forms of Root Rot or Pourridie.

Lengthy descriptions of each fungus, together with their complete life histories, are not here possible. They can be found in special works dealing with the subject. A brief summary of the leading characteristics of each, and of the best methods of treatment, is all that space will permit. As regards the second group, which is by far the more serious one, the evidence so far as the chances of their ever becoming a serious menace to our vineyards is most reassuring It is not, as might be thought, our isolation which protects us, but our peculiar climatic conditions, and more especially the dryness of our atmosphere. Even if introduced into Victoria, they would be unable to develop.

That this is not merely a personal opinion, but actual fact, is abundantly proved by the parallel case of California. The climatic conditions in the greater part of that State are remarkably similar to our own, especially as regards the dryness of the atmosphere. Now, although these fungus diseases are indigenous to the eastern States of the Union, where they have existed since pre-historic times, they are quite unknown in California. They have no doubt frequently been introduced into that State, as Professor Bioletti pointed out in a recent letter to the writer*, but with one single and not too clearly proved exception they have never been seen in that State. The matter has been dealt with at some length in the last Report of the Department of Agriculture (1907-10).

It is unnecessary to repeat the arguments then put forward, but we may rest assured that the diseases which wreak so much havoc in many parts of France need never be a source of anxiety to Australian vignerons.

In order to avoid possible confusion, it is necessary to explain the different uses made of the word mildew in France and in America. In the former country its use (spelt mildiou) is confined to the fungus known in America as Downy Mildew, in opposition to Powdery Mildew, which is the name there usually given to Oidium.

OIDIUM (*Uncinula spiralis*).

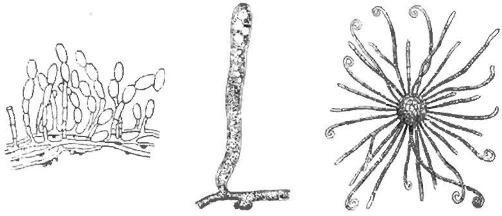
This disease is so well known to us as to scarcely need description. It is caused by a microscopic fungus belonging to the family of *Erysipheæ* and the great fungus group of *Ascomycetes*. Though first known as *Oidium Tuckeri* and later as *Erysiphe Tuckeri*, these names have now been abandoned in favour of the present one of *Uncinula spiralis*, given to it on account of the spiral filaments attached to the perithecia or winter fruits of the fungus. (No. 3 in illustration.) These bodies, which are just visible to the naked eye, were not observed in France prior to 1892, though they had, long before this, been regularly noted in America.

* See Report of the Department of Agriculture, Victoria, 1907–10, p. 251.

The absence of this form in France led mycologists to consider French Oidium to be a different fungus to that known in America. It was subsequently found that they were one and the same organism, and that the formation of its winter fructifications is a question of climatic conditions.* Such conditions are more frequent in America than in France.

The formation of perithecia has a practical interest, since it is thought, in some quarters, that the fungus resulting from the germination of spores contained in these bodies possesses greater vigour, and is therefore capable of doing more damage than that resulting from hibernating forms. So far as the writer is aware, perithecia of Oidium has not yet been observed in Victoria.

The discovery of these bodies in France in 1892 proved the identity of French and American Oidium and the American origin of the fungus. It made its first appearance in France in 1845, or long before the other vine fungi of American origin we shall shortly consider. For the first few years, in fact, until a remedy was found in the shape of sulphur, its ravages were very considerable. Nowadays the damage caused by it is much less serious than that due to Downy Mildew.



1 2 3

OIDIUM (*Uncinula spiralis*)

1. Horizontal mycelium with suckers (black) and upright spore-bearing filaments (*after Durand*). 2. The same more highly magnified (*after Vialla*). 3. Perithecium or receptacles containing the winter spores (*after Vialla*).

The diagrams reproduced illustrate the different forms of the fungus. It differs radically from all other vine fungi in that the mycelium or vegetative portion is exterior to the tissues of the plant. It runs over the surface, sending suckers into the cells by means of which it obtains its food. From this mycelium, spore-bearing filaments arise on which Conidia or summer spores, serving to spread the disease, are produced in great numbers. This external character of its mycelium makes the Oidium more amenable to treatment than almost any other vine fungus. When, as is the case with the other species which attack the vine, the vegetative portion is buried in the tissues of the plant, it is out of the reach of fungicide treatment, since the tissues are more easily damaged by chemical agents than the mycelium of the fungus. In such cases, preventive treatment alone can be successful. With Oidium, on the other hand, direct or curative action is easy, since an application of sulphur destroys the growing portion.

* If, after a period of warm, moist weather, which has produced an abundant growth of Mycelium, the temperature suddenly falls to near the lowest limit for the growth of the fungus (50° F.), they are produced rapidly and in great numbers.—Prof. F. T. Bioletti, Bulletin No. 186, University of California Publications, p. 325

It, however, has but little effect on the spores, and should the sulphur be washed off by rain re-infection may occur.

Sulphur, though the oldest, is still the standard remedy. Its action in destroying the fungus is undoubted, though its mode of action is not quite clear—most probably it is through the fumes given off directly under the heat of the sun. In France three sulphurings are looked upon as absolutely necessary.

1st. In spring, when the vine shoots are 2 or 3 inches long.

2nd. At blossoming time.

3rd. A few weeks before the grapes ripen.

In Southern France, these three sulphurings are usually sufficient, though they have frequently to be supplemented by further applications.

The cost of the three sulphurings, according to figures supplied by the Manager of the Salains du Midi Company at Montpellier, amounts to six shillings per acre, of which the cost of the sulphur represents five-eighths of the total. In most other parts of France the three standard sulphurings are insufficient. They have to be frequently repeated, thus raising the cost of the treatment.

HORSE-DRIVEN SULPHURING MACHINE.

The effects of sulphur on the general vegetation of the vines are very beneficial, apart from its fungicide action, though in what way this is caused is not clear. It is compared to a tonic, and many authorities consider that, even if Oidium did not exist, the advantages accruing from an application of sulphur are sufficient to justify its use. Sulphur has also a marked influence on the blossoming of the vine, counteracting the non-setting of fruit to which some sorts are liable.

In the past, in Victoria, it has been considered necessary to only sulphur vines in the early morning when the dew is on. This rule is no longer adhered to in France; in fact, the middle of the day is held to be the most favourable time, except in very hot weather, when application in the hot sun might lead to burning of the foliage.

Machines for applying sulphur have improved considerably of late. The knapsack sulphurer of Vermorel, and other makes, already known in Australia, are a marked improvement on the old-fashioned bellows. Traction machines, capable of treating a large area in a short space of time, have recently been introduced, one of which is shown in the illustration. These machines are now much used in France in vines closely planted in the row and in trellised vines, where the vegetation along the row is continuous, so that there is no waste of sulphur. They work in a very satisfactory manner.

Permanganate of potash has a powerful action on the Oidium fungus, which is immediately killed by contact with its solution. Sprayed at the rate of 1¼ per 1,000, it is recommended in cases of very severe attack. As the effects of this solution are transient, it is well to always follow it by an application of sulphur.

Alkaline poly-sulphides are also recommended for the treatment of Oidium, especially in wet weather, when sulphur is too rapidly washed off to enable it to exert its influence. They are dissolved in water at the rate of ½ per cent, and applied with a spray pump.

In France, Oidium, though more prevalent than with us, is looked upon as a less serious disease, and one which it is easier to keep in subjection than either Downy Mildew or Black Rot.

A point of practical interest at the present moment is the uselessness of preventive winter treatment in the case of Oidium. After the prevalence of the disease last summer, many growers have mentioned to the writer their intention of applying a winter treatment. Though these have been frequently tried in France, they are considered to be quite ineffectual. The first sulphuring, as mentioned above, which is often omitted by our growers, is of far greater value as a means of preventing outbreaks next season than any winter treatment can possibly be.

(To be continued.)

ORCHARD AND GARDEN NOTES.

E. E. Pescott, Principal, School of Horticulture, Burnley.

The Orchard.

Ploughing the orchard should now be completed; and, where necessary, the drainage system should be continued and increased. A dressing of stable manure should now be given wherever it is needed; and, if any artificial manures are to be used, especially if in the form of bonedust or potash, they should be applied now, so that they will be available as food for the roots in early spring. A dressing of lime may be given with great advantage to heavy, cold, or sour soils.

Spraying should be started for aphis, mite, and scale troubles; and, if the pest is at all severe or obstinate, the work should be done before pruning. Crude petroleum, red oil, and kerosene emulsions are all useful in dealing with these pests.

PLANTING.

It was recommended in the *Journal* for March and April that land intended for new orchard areas should then be ploughed in anticipation of the planting season. It will now be of advantage to have the soil cross-ploughed; and, if it were not previously subsoiled, this should be done at the same time as the ploughing. After the ploughing, the surface should be well harrowed and cross-harrowed, to reduce it to a fine texture and tilth.

The trees should be planted out so that they shall be 20 feet apart each way. When the surface has been well cultivated, a furrow may be run across the area at every 20 feet, and the trees planted in the furrow, 20 feet from each other. If the furrows are ploughed, there will generally be no necessity to dig holes for the young trees. They can be placed in the furrows and the soil well and firmly placed around them. The

balance of the furrow could be filled or harrowed in level. Deep planting is a great mistake; and no tree should be planted at a greater depth than it was growing in the nursery. The roots of the young trees should be well cut back before planting.

Varieties to Plant.

A number of letters have been received making inquiries on this subject, and it is considered advisable to reprint a list of fruits that were advised for planting for a long succession for either market or home supply.

Apples.—Red Astrachan, William's Favourite, Gravenstein, Emperor Alexander, Jonathan, Kentish Fillbasket, Pomme de Neige, Cleopatra* (in northern districts), Munroe's Favourite* (in northern districts), Reinette de Canada, London (Five-crown) Pippin, Rome Beauty,* Stewart's Seedling, Lord Wolseley, Statesman, Rymer, Yapeen Seedling,* Granny Smith,* Yates (in good moist soil), Rokewood.

Pears.—William's Bon Chrêtien,* Howell Beurré Capiaumont, Beurré Bosc,* Louise Bonne of Jersey, Marie Louise, Josephine de Malines,* Glou Morceau, Broompark,* Winter Cole,* Winter Nelis, Black Achan, Harrington's Victoria.

Plums.—Early Orleans, De Montford, Angelina Burdett* (D'Agen), Diamond, Jefferson,* Coe's Golden Drop,* Pond's Seedling, Fellemberg,* Silver Prune, Reine Claude de Bavay, Grand Duke.

Japanese Plums.—Wright's Early, Burbank, Climax, Satsuma, Wickson, October Purple.

Peaches.—Brigg's Red May, High's Early Canada,* Hale's Early,* Early Crawford,* Royal George, Late Crawford,* Elberta,* Lady Palmerston, Muir,* Salway,* Wonderful,* Pullar's Cling.*

Apricots.—Oullin's Early Peach,* New Large Early,* Campbellfield Seedling, Large Red, St. Ambroise,* Moorpark,* Dundonald, Royal George, Royal.*

Oranges.—Washington Navel,* St. Michael's Paper Rind,* Mediterranean Sweet,* Queen,* Valencia Late.*

Lemon.—Lisbon.*

An export orchard should contain very few varieties, the fewer the better; and the grower should concentrate all of his energies on the few varieties grown, instead of filling up his orchard with a large number of varieties that will require constant and difficult handling. Therefore, a selection *only* should be made from the above list. Varieties indicated by an asterisk are suitable for cultivation in the Northern irrigated areas.

Pruning.

Fruit trees are pruned to attain various results, and these are the reasons and objects for pruning:—

1. To frame and shape the tree, so as to space its limbs evenly, to admit light and air, and to afford protection from sun and winds.
2. To promote wood growth.
3. To remove injured, unfruitful, superfluous, or worn out parts.
4. To produce fruit, and to increase its size and quantity.
5. To insure regular crops.

For the first few years of its existence, a fruit tree is pruned according to objects 1 and 2; that is, it is pruned so as to regularly space and design its limbs, and it is pruned for wood growth alone.

Therefore heavy pruning is the rule for young trees; as a rule, far more is removed than remains. A tree is received from the nursery with its roots more or less damaged, and these are cut back considerably so as to allow the tree to produce a new, young, and strong vigorous root system. The top is also cut heavily, that is, far more is removed than is left.

Three or four main arms are selected as the basis of the leader formation. These are cut back, leaving only three or four strong buds on each; the cut is always made so that the top bud shall be on the outside of the leader, and never on the inner portion of the framework. Two, or perhaps three, of these buds will break away into strong growth in the spring-time; the stronger of these will be selected next winter, and instead of the young tree having three main arms, it will have from five to seven. These are again cut "hard" back for similar strong growth in the subsequent spring; and they are similarly treated in the following winter. Thus, at the end of the third winter pruning, the tree should have from nine to twelve (and probably more in good soils and favourable situations) good, strong *leaders, all evenly balanced and spaced for the admission of sunlight and* air, all inclining or sloping in an outward direction, and all breaking away well down and low, as near the crown of the tree as possible. The latter is a most essential point in the framing of a tree. It may, of course, be necessary in future years, for renewal purposes, or perhaps to fill in spaces in wide spreading trees, to allow the development of a sub-leader half way up the branch, but this must not be allowed in the early architecture of the tree.

By cutting "long," that is, by leaving the main shoots too long, in the earlier building of the tree, the framework will be very frail, and when the stress of bearing is reached, the tree is broken down; under these circumstances, it is not easily possible to replace the lost leaders. Further, a "two-story" tree always has a bad appearance, and regularity in orchard work is just as necessary as it is in house building.

After the third or fourth year, the aim of the pruner should be towards production of fruit-bearing wood. During these years, the tree has not been unmindful of this, and quite a number of weak lateral growths will have been produced. These may always be retained, unless they become too long and spindly, when their length may be somewhat reduced. These laterals will produce all along their length a number of fruit buds, and they are thus valuable wood. A strong growing lateral may always be shortened back, or cut out altogether.

Now that the time for fruit-bearing has come, the rule referring to light or weak pruning comes into force. The tops of the leaders should be cut lightly back every year, and always to an outside bud. As a subsequent result, the leader frequently breaks away into two or three growths in the following spring. Only one of these, the uppermost one generally, must be retained; the others may be removed, unless one is needed for spacing purposes. These growths may advantageously be removed in early summer. Should the leaders be growing away to excessive height, the tree thus becoming very tall and unwieldy, the topmost growth, which will very frequently incline almost to the vertical, may be cut out. Utilize one of the other outward growths to continue the leadership, and tip this lightly in the winter. Thus, by lightly cutting the tops of the leaders, the sap is more evenly distributed through the tree, and the result is the formation of fruit buds, fruit spurs, and lateral growths.

Fruit buds may always be distinguished by their well-nourished, plump appearance, in contradistinction to leaf or wood-buds, which are flattened, and which often lie flat along the wood. Fruit spurs are the prolongations of fruit buds, often branching into various buds with age. Laterals are the weak, twiggy growths which, in their second and subsequent years, generally produce fruit buds along their course. Strong growing, as well as upright, laterals must always be suppressed, cutting them back to a few basal buds, or removing them altogether. Vertical growths of any description should always be discouraged in fruit trees; as such upright growths induce a free rush of sap, the sap thus strengthening them, and depriving the lower and other parts of the tree of their legitimate nourishment. Slow sap movement always results in fruit production, and this can be attained by (*a*) sloping the whole framework of leaders out at a fair angle, and (*b*) suppressing or changing the direction of growth of any strong upright growths, whether laterals or leaders.

In the management of the lateral system, it is generally advised not to interfere with these unless they become too strong, when they may be treated as previously advised. Should they become too long, thus unduly interfering with each other, they may be shortenend back, but always to a sub-lateral growth, which often occurs at right angles to the parent, or to a fruit bud lower down. To cut to a leaf bud merely induces a continuance of growth, with a consequent reduction of fruiting strength.

These remarks refer mainly to apple, pear, and plum trees: and, in the case of the first two varieties of fruit, it is generally advisable not to interfere with the laterals until they have formed their fruit spurs. A too thick or numerous lateral system may always be thinned out, but it must be remembered that once a lateral is removed entirely, it is very difficult to replace it, and impossible in some varieties of fruits. For peaches and apricots, it is always advisable to shorten back, and to continue to shorten back annually all fruiting wood. Where an apricot or peach tree produces laterals carrying no fruit spurs, these may be cut right off, as basal buds are generally present to produce fresh lateral growth. Only in the case of early fruiting varieties may these growths be retained, as they will in all probability produce fruit spurs late in the season.

Having carried out these instructions the tree should be well framed, and well furnished in legitimate places with a good amount of suitable fruitful wood. If, after the fourth or fifth year, the top growths are regulated in the manner described, the strong surplus top-growths being all suppressed except the leader; and the tree prevented from becoming a "broom," *i.e.*, all growth on the top, then a suitable type of tree for local conditions will have been produced, a tree which should produce its fruit for the lifetime of the grower and probably longer. It must be understood that to possess a tree on which strong upper growths are permitted, the fruit-bearing abilities of the tree are greatly restricted, the fruit is being produced in entirely the wrong place, and the tree becomes most unmanageable for all pruning and other operations. The type of tree most suitable to local conditions is one low crowned, with a short trunk, carrying a fair number of equally spaced limbs or leaders, and having it regular and shapely withal; having no crowding of branches, the top light, and all leaders well inclining outwards at a fair angle—as near to 45 degrees as possible. If this be done, then the tree will regularly produce its fruiting spurs and wood, the crop will be placed in the lower regions of the tree, where it can be conveniently managed; and it will produce the greatest quantity of superior fruit at a minimum cost of labour to the grower.

Vegetable Garden.

Asparagus beds should be well cleaned out, and as soon as any young seedlings appear they must be culled out and thrown away. The work of digging the beds should be continued, digging in manure that was previously spread on the surface. Any seedling vegetables may be planted out; and the seeds of various sorts, such as peas, broad beans, carrot, leek, lettuce, spinach, radish, &c., should be sown.

Flower Garden.

Digging in the garden should be continued. Before digging, the beds should be given a top dressing of lime or of stable manure, and subsequently these could be dug well into the soil. Care must be taken not to injure the roots of any shrubs, trees, or roses. Root cutting and root pruning will always dwarf any plant. In digging, it is not wise to discard any leaves, twiggy growths, or weeds. Unless they are required for the compost heap, they should always be dug into the soil.

Hardy annuals may be worked into the beds, either as seeds or as transplanted seedlings. Cuttings of roses and hard wooded shrubs may be planted. In putting in cuttings, the base should be cut perfectly level, all buds or eyes below the surface should be cut out to prevent suckering, and the cutting should be placed in an upright position in the bed. Roses may be pruned, and, where necessary, flowering shrubs may also be so treated.

After flowering, evergreen shrubs may be well thinned out, especially removing any weak, upright, or old flowering growths; keep the shrub always at an outward growth, inclining it to a broad bushy type instead of to an upright habit. By this means, the lower regions will always be furnished with good growth. Shrubs and trees of all descriptions should never be allowed to become too crowded; they require to be opened, so as to allow sunlight and air into the interior, where it is most needed. This is one means by which this class of plants may be kept healthy and free from disease. Very few shrubs resent pruning, and the majority of them, including Australian shrubs, such as *Acacias*, are very amenable to the pruning knife.

In rose pruning, the rule is that strong growing plants require less severe cutting than weak growing ones. As roses always flower on new wood, it is essential that to have good blooms, the bushes must be pruned regularly. All weak growths, exhausted and worn-out wood must be removed, retaining only the vigorous growths. It is generally advisable to prune to four or five eyes or buds, so as to have subsequent strong growths, always pruning into the previous season's wood. Spindly growths, especially in the centres of the bushes, should be removed, the plants being trained with an open and angular habit.

DESTRUCTIVE INSECTS OF VICTORIA, PART V.

The attention of readers of the *Journal* is drawn to the notice on the back cover regarding Part V. of the *Destructive Insects of Victoria*, which is now available.

SEEDS AND SEEDING.

L. Macdonald, Horticulturist, Dookie Agricultural College.

There are few, if any, more important operations in the garden or on the farm than the judicious sowing of the seed. On the careful carrying out of this work depends, in a great measure, the success or failure of the crop. It has been said by a well-known agricultural writer, that "every young man who intends to be a farmer should put in at least a year in a market garden to learn how to handle small seeds." There is little doubt that gardening gives one a close association with the requirements demanded of a great variety of seed; also, the tending of plants and seeds presents opportunities of becoming familiar with their likes and dislikes, to an extent that does not obtain on the farm.

Some of our fodder crops have taken a long time to establish themselves with the farmers, owing to the requirements of their seed not being understood. Failures have occurred, not through any fault of the seed, or because of the plant's non-adaptability to our conditions, but through a disregard or ignorance of the seed's simple requirements. The poor farmer, or careless gardener, is often prone to attribute bad results to defects in the seed. The latter, doubtless, was a prolific source of dissatisfaction some years ago, but of late years the standard of seed has been raised considerably.

Patchy crops, such as one often sees, particularly with rape and lucerne, with broken drills and lean wastes, are often due more to the defects in the seed bed and seeding, than to the seed. Accidents beyond our control, such as adverse climatic conditions, are frequently a factor in the failure of many crops, but the dire effects of such conditions can often be staved off by judicious tillage and intelligent seedage.

No matter how good or how bad the soil, a well-prepared seed bed, with due consideration for climatic and other conditions, will always enhance the chance of success. A well-started plant with its absorbent roots deeply plunged beneath a sheltering mulch, in a well-worked soil, is always more likely to survive and give a better return than one badly sown on haphazard cultivation, where its existence is precarious, its growth fitful, and its life a prey to the blighting action of disease or other adverse conditions.

For the beginner, it is not so essential to acquire a knowledge of the peculiarities of each species or variety of our farm or garden seeds as it is to understand the principles that govern the healthy germination and growth of seeds generally. These principles remain practically the same throughout. Modifications may be necessary at times to suit untoward conditions, but these are more the exception than the rule.

Hardy and Half-Hardy Seeds.

The seeds in this country are divided chiefly into two classes:—Hardy and half-hardy seeds of the garden, or winter and summer crops of the farm. Owing to our genial climate, our classification of plants in respect to hardiness is somewhat different from that adopted in many European countries, which are subject to more rigorous climatic conditions. Beet and lettuce, classed in Europe as half-hardy, thrive through the winter in most places in Australia, and are generally accepted as hardy; while their tender seeds, such as tomatoes and cucumbers, are among our half-hardy ones.

Australia, considering its extent, is singularly endowed, in respect to climate, for the production of agricultural products. With many of our annual plants two crops can be grown in the year. This is particularly so where water is available; while in some of the European countries only one is procurable. The above terms in respect to the qualities of seeds are not necessarily accurate and are, in fact, often likely to lead one astray. Considered from an economic standpoint, a plant should not be classed as hardy in any locality unless it is able to withstand the vicissitudes of climate and other natural conditions in that locality. Many of our so-called hardy plants cannot do this. They are unable to withstand the heat of our summers with satisfactory results. Examples in point are cauliflowers, broad beans, turnips, collinsia, lychnis, viscaria, &c. Many of the half-hardy seeds, such as melons, are impatient of excessive moisture at low temperatures; hence it is inadvisable to plant them too early, except in warm well-drained situations. As a general rule, however, the term "hardy" is applied to those plants that withstand frost. They are grown chiefly during the winter months. Half-hardy plants are those that cannot withstand

SEED PACKET USED AS A HAND SOWER.

MAKING BROAD DRILLS FOR CARROTS.

frost, such as tomatoes, French beans, melons, &c., and are grown only during the warm months of the year. Tender plants are those that do not succeed well in the open and are best grown under glass.

Although the terms hardy and half-hardy are synonymous practically for winter and summer growing plants respectively, we find examples of garden crops, such as cabbage, turnips, &c., that have certain varieties adapted to different seasons. These varieties have been evolved slowly through years of culture, and are usually the result of cross-breeding and selection. The objective in breeding has been not only the amelioration of type, but the adaptation of variations to different seasons and conditions; and thus the prolongation of the season of use, and its consequent economic advantages.

SOWING.

Seed sowers of various kinds have now been on the market for years. Improvements and additions are made almost every year. Some of these makes are specially suited for planting certain sizes of seed, such as onions or turnips. Owing, however, to the great difference in the size of garden

seed and the peculiar nature of some soils, the difficulty will be recognised of obtaining an implement that fulfils what is demanded of a good sower, viz. :—

1. To sow any kind of garden seed.
2. To sow any depth.
3. To sow any distance apart, and under any ordinary conditions when such seeds may be sown.

A great many sowers will work well with a certain size of seed, under a special set of conditions, but usually there is some drawback that is opposed to their adoption for common use in small gardens. The frequent re-adjusting that is necessary in sowing different kinds of seeds in small lots, and the lack of uniformity in the preparation of soils for different crops are, perhaps, the greatest disadvantages. Large seeds are quickly and easily sown by hand in small areas, while for a small seed a number of hand sowers are in use. These are of great assistance to the amateur in gaining an even distribution. The ordinary seed packet or bag can be made to serve the purpose of a sower by tearing back the flap at the corner of one end.

In field operations, the drill has steadily superseded broadcast sowing by machine or hand, owing chiefly to its possessing the following advantages, viz. :—

1. It sows at a uniform depth, thus securing better germination.
2. Less seed is required per acre.
3. It permits a better control over the quantity sown.
4. Fertilizers may be evenly distributed with the seed.

Probably the more important features in carrying out seedage operations are as under :—

1. Quantity to plant;
2. Depth to plant;
3. Selection of kind of variety.

Germination may also be added here, although it is really an after result that is governed by sowing. Let us consider these items under their separate headings.

Quantities to Plant.

This will depend chiefly on :—

1. The tillering or branching propensities of the plant.
2. The season of sowing.
3. Uniformity of planting.
4. The condition of the seed.

In connexion with most of our agricultural seeds, experiments have proved what quantities, sown under normal conditions, give the best results. The intelligent grower, however, accepts these quantities as provisional, and makes his sowing heavy, light or medium, according to conditions and the peculiarities of the variety. Many early maturing annual plants as, for instance, Bunyip wheat, Early York cabbage, and Early Purple Top turnip, do not shoot or spread out in the same manner as certain other varieties, *e.g.*, Dart's Imperial wheat, Drumhead cabbage, and White Stone turnip. Hence, heavier seeding or closer planting should be adopted to obtain the best returns. While, with those varieties that desire a free development of branches or leaves, light seeding should be adopted. If they are sown thickly, "drawing" results, and, with root crops, the top is developed at the expense of the root. With cereals, too much flag and

stalk are developed. The result is that the crop is exposed to the injurious effects of various pests and adverse weather conditions.

When seed is sown at a uniform depth and covered evenly, better germination is obtained and a greater number of plants survive. Broadcast sowing, with harrowing or raking in, leaves the seeds at uneven depths, many being entirely exposed on the surface. These exposed seeds, of course, run the gauntlet of many destructive agencies. Even if they succeed in getting a foothold, they are later on in life lashed about on their axes by every wind that blows, with the result that of the original number a large percentage fail. When seeds are weak, owing to age, immaturity, or some other cause, fair germination may often be obtained under genial conditions; but, when the latter are at all trying, large numbers will fail. Hence, it is advisable to make heavier seedings in such cases.

It is a common rule, in the practice of intense culture, that small seeds should be sown thicker than the plants are to remain. Thus selection is

TURNIPS, BROADCAST AND IN DRILLS.

permitted. This selection has been a potent factor in the amelioration of garden plants. The plants remaining after thinning are more likely to give good results as it is only the best plants that are left; besides, the loss of labour, land, and a season is avoided. Relatively, the cost of preparing land for heavy feeding crops is great, while seeds are cheap; hence, it is better to hazard a little additional seed as a safeguard against failures than to lose the full productive power of the land for a season. In frames or small patches, where conditions can be controlled, only a small allowance should be made for failures.

The quantities recommended in seed catalogues are usually on a liberal basis; in many cases, far in excess of the actual number of plants required. However, taking results over a number of years, sowing at different seasons, under changing conditions, with variable seed, there is probably not an unwarrantable excess. These catalogues are of value to the amateur in indi-

cating what quantities to sow, but the experienced seeder knows that the points referred to above will govern the quantity to be sown. The examples given in the following table will indicate the results that would be obtained from the sowings usually recommended. They are from a number of experiments conducted by the writer several years ago. The seeds were obtained in the ordinary way from a firm of seedsmen and sown in the open garden. A light mulch of short horse manure was provided in each case, and the ground kept continually moist during the process of germination.

Seed.	Variety.	Quantity Recommended.	Quantity Sown.	Extent of Sowing	Germination.	Results.
				ft.		
Beet ..	Crimson Globe	1 oz. to 50 ft.	1 oz. to 30 ft.	180	Very good	Far too thick
.. ..	Eclipse ..	1 .. 50 ..	1 .. 50 ..	150	..	Very much too thick
.. .	Egyptian ..	1 .. 50 ..	1 .. 75 ..	225	..	.. ..
.. ..	Eclipse ..	1 .. 50 ..	1 .. 100 ..	300	..	Much too thick
. ..	Crimson Globe ..	1 .. 50 ..	1 .. 120 ..	480	Fairly good	.. ..
.. ..	Blood Red ..	1 .. 50 ..	1 .. 150 ..	450	..	Patchy; little thinning
.. .	*Egyptian* ..	1 .. 50 ..	1 .. 175 ..	700	*Good* ..	*Little thinning*
.. ..	Crimson Globe	1 .. 50 ..	1 .. 200 ..	800	Very good	Very little thinning
Turnip .	White Globe	1 .. 100 ..	1 .. 80 ..	280	..	Very much too thick
.. .	..	1 .. 100 ..	1 .. 100 ..	300	..	.. ..
.. .	..	1 .. 100 ..	1 .. 120 ..	360	..	.. ..
..	Imperial G.G.	1 .. 100 ..	1 .. 140 ..	420	..	Much too thick
.. ..	..	1 .. 100 ..	1 .. 160 ..	480	..	Very much too thick
.. .	Champion Purple Top	1 .. 100 ..	1 .. 220 ..	660	..	Fairly thick
.. ..	..	1 .. 100 ..	1 .. 240 ..	720	..	..
..	..	1 .. 100 ..	1 .. 260 ..	780	..	Patchy; little thick
Parsnip	Hollow Crown	(Variously estimated)				
		1 oz. to 100 ft. or	1 oz. to 100 ft.	300	Good ..	Far too thick
..	..	1 .. 200 ..	1 .. 200 ..	600	.. ..	Very much too thick
..	..	1 .. 200 ..	1 .. 300 ..	600	Poor ..	Much too thick
..	..	1 .. 200 ..	1 .. 400 ..	800	Fair ..	Little too thick
.	..	1 .. 200 ..	1 .. 500 ..	1,000	Good ..	Much too thick
..	..	1 .. 200 ..	1 .. 600 ..	1,200	.. ..	Fairly thick
Radish	Icicle ..	1 .. 100 ..	1 .. 75 ..	225	Very good	Very much too thick
..	.. ..	1 .. 100 ..	1 .. 100 ..	300	Patchy ..	Rather thick
..	Giant Crimson	1 .. 100 ..	1 .. 125 ..	375	Fair ..	Too thick
..	..	1 .. 100 ..	1 .. 150 ..	500	Good ..	Much too thick
:	..	1 .. 100 ..	1 .. 175 ..	550	.. ..	.. ..
.	..	1 .. 100 ..	1 .. 200 ..	600	.. ..	Little too thick

It will be seen that the quantities were generally much in excess of the actual number of plants required. However, it cannot be claimed that these experiments were in any way conclusive. They indicate, however, that with seed of average quality under genial conditions lighter seedings can be adopted. I have found in experiments conducted at other seasons, under adverse conditions, that even the heaviest sowings recommended were not unduly excessive, while the light sowings were a failure. It may be added here, that when conditions are so unfavourable to the germination of the seed they are usually unsatisfactory also to the future growth of the crop. Turnips sown at the rate of 1 oz. to 200 feet were patchy, owing to defective germination and attack of flea beetle. The sowing of parsnips at 1 oz. to 200 feet was much too thin, owing to poor germination due to defective conditions, chiefly too great a variation in temperature. Beet sown at 1 oz. to 100 feet, was thin and patchy, owing to defective seed and to the lack of continuous supply of moisture.

DEPTH TO PLANT.

Owing to the difference in the requirements of various seeds, the physical nature of different soils, and the extreme variation of some soils

LETTUCE AND CARROTS ON NARROW BEDS, SHOWING MULCH FOR SUMMER PLANTING.

GOOD PREPARATION FOR SMALL SEED.

Beet in broad drills on right and narrow drills on left, with lettuce for companion crop.

at different seasons of the year, it is impossible to lay down any hard and fast rule regarding the depth to plant, that will work season in and season out, with all sorts of seeds, in different soils. An old gardener's rule was to plant seeds twice their diameter in depth. This rule may be of some value in planting small or "round" seeds in frames or glass-houses, where the soil is finely prepared and the conditions well under control; but it is of little or no practical value in field operations. Seeds are generally planted much deeper. Where horse tillage is adopted and heavy implements used, they often reach ten, twenty, or fifty times their diameter in depth. With many seeds that require the presence of moisture over a long period for germination, it is distinctly advantageous to plant comparatively deep. This is particularly so during the dry season. With many of the leguminous seeds which contain a varying percentage of what are known as "hard seeds," such as clover, this deep planting is attended with good results.

The chief factors that invariably govern the depth to plant are:—

1. Whether the soil is wet or dry.
2. Good or poor tillage.
3. The kind or size of seed.
4. The season.

If the soil is wet, and likely to remain so long enough for the process of germination and for the establishment of the young plants, shallow planting should be adopted. This is particularly so in many of the northern areas where the soils are lacking in nitrogenous matter, and have a tendency to settle down close after rain; which results in the exclusion of air, to the detriment of the seed. Little moisture is required to germinate most seeds; and even a limited contact with the wet soil in the large sheltered interstices will bring about the desired result. In dry soil, where the moisture is at greater depth and the surface soil is loose and granular, containing a good supply of air, seed can be sown much deeper. They thus get the benefit of soil moisture; find a more genial temperature; and the loose surface mulch does not present the difficulties in the upward extension of the first seed leaf or leaves, that occur where the soil is close. If the soil is likely to become drier after planting, it should be firmed down over the seed. They thus get a better contact with the soil and the benefit of such moisture as it contains. This is, however, only a temporary expedient, and should be adopted with caution, as it hastens evaporation by increasing capillarity.

Firming down is adopted with peaty or nitrogenous soils that have a great surface movement, or where they become open or friable on top. If the soil is dry, the seed will remain without deterioration for a long time after sowing. Once the process of germination is started, however, they should be kept continually moist until well above ground.

It is obvious that if the soil is well tilled, its particles will lie closer together; its capillarity will be greater, and any seed lying in the smaller particles will get a better contact with the soil and the benefit of available moisture; while the reverse will be the case where the ground is rough Hence, as a general rule, the seed should be sown shallower in well-worked than in poorly-worked soil.

Large seeds are, as a rule, sown deeper than small seed. However, this is not so in a comparative sense. With those seeds that are of a fatty or oily nature, shallower planting should be adopted, unless their covering is of an open, airy nature. In the successful propagation of many plants, Nature will often give a clue to the close observer. Man, to meet his needs, has transported plants far from their native habitat; and, in their new and strange environs, these plants often show a disability, or fail

to reproduce themselves naturally, because the conditions demanded by their seed are absent. Hence, the propagator has artificially to provide those conditions, and in this connexion a knowledge of Botany is often a contributory factor to success. Because of being unable to adapt themselves to their new surroundings, hybrid plants and improved varieties often fail to do what is expected of them.

Deciduous trees and many evergreens shed a large quantity of leaves over the ground beneath them. These leaves provide a natural mulch to the fallen seed and, when thick enough, assist their germination. The writer has found that with some seed, such as oak acorns, it is best to follow Nature's ways; and, instead of burying them in the soil, where they rot easily, just lay them on the surface with a good mulch of dead leaves spread over them, keeping them continually moist, when a good germination will usually result.

FRENCH BEANS ON NARROW BEDS, ROUGHLY PREPARED, WITH GUTTERS FOR IRRIGATION.

Seed that takes a long time to germinate, and is impatient of extremes in temperature, such as celery, parsnips, &c., should be kept moist continually, until well above ground. When the soil is inclined to "cake" or set on top, and surface watering is carried out, it is advisable to plant shallow and mulch with short manure. Mulching is impractical in extensive field operations, but is largely adopted in the practice of intense culture. The difficulty of starting seed in summer is the rapid evaporation of moisture and the setting of the surface soil. The latter does not allow a sufficiency of air to reach the seed. If the sun heat is strong, and the soil dries even for a few hours at a critical stage of germination, large numbers of the seeds will fail, whereas with a mulch of short manure evaporation is retarded. Watering can then be controlled better, while the fertilizing qualities of the manure will leach out in watering, and be a stimulus to the young plants.

(To be continued.)

MAGGOT FLY IN SHEEP.

H. W. Ham, Sheep Expert.

The fly chiefly accountable for this trouble is the Common Yellow Blow Fly; while the Blue Bottle Fly, in some parts, is also responsible, but not to the same extent. The first serious trouble met with by the writer, through this pest, was about 1897 in rabbit-infested timbered land on the calm warm eastern slopes of the You Yangs, between Melbourne and Geelong. On the Lachlan River, north of Hillston, New South Wales, no serious trouble was experienced until after the break up of the main drought in 1902, and following the almost total destruction of rabbits by poisoning and loss of stock through shortage of water. The scourge gradually manifested itself, and from then the practice has grown for each boundary rider to carry shears, a necessity previously unknown.

About the year 1894 it was considered that an advantage would be gained by increasing the weight per head and the covering of our merino flocks, for the lightest and best merino wool was unprofitably low in value, top grades of Victorian and New South Wales wool realizing no higher than 7½d. to 8½d. per lb. Second class merino wool was worth from 6d. to 7d., and sheep growing this wool could be easily made to give the greatest weights. There was no indication that these prices would not continue, for up to then there had been good seasons. This was the commencement of the demand for dense heavy cutting excessively covered sheep; and a special point developed was the filling in with wool about the breech and tail.

With the advent of the maggot fly, this became a disadvantage, as the wool acted as a place of lodgment for fluids passing from the body; for example, when scouring, especially in weaners; and, in the case of ewes, through liquids soaking the wool at time of lambing. This is most noticeable in seasons when ewes have greater difficulty in cleaning, consequent on their low condition. Well bred merino ewes are most subject to attack by the fly, particularly those that are weak and overloaded with wool, while the bare pointed Leicester type of sheep suffers the least.

Wholesale destruction of rabbits has been, no doubt, a factor in increasing the number of flies; and to this must be added the carcases of stock, which afford a splendid breeding ground. Further, the natural enemies of the fly have decreased. Ring-barking of trees, bush fires, and other causes have discouraged the increase of bird life, and underground enemies such as lizards, iguanas, &c. It is no uncommon thing, in the autumn, to find thousands of the brown cases, from which the young flies have developed, in the dust about and under where carcases have dried. The maggot takes about a week to attain full size and a fortnight to develop into a blow fly. These periods vary according to weather conditions. Insufficient moisture in the soil or heat too intense is not favourable to its development, but sufficient moisture for the purpose is usually supplied from the decomposing carcases.

The seasons in which the discharge from weaners and lambing ewes is greatest are usually the most favourable for economical destruction of rabbits; and, if early autumn rains occur, perfect conditions for the breeding of flies are created.

TREATMENT.

The little relief obtained so far has been by causing the death of the maggots soon after they are deposited, or just after they begin to move into the wool. The point to be particularly noted is, that the greater the discharge from the animal, the greater the dilution and consequently weakening influence of the preparation used for the purpose. Finely prepared poison powder has been found to be the best for all cases of flyblow, but if mixed with any viscous material it does not break down into the new grown wool, a most important point to obtain. Water, so far, is the best medium for the purpose. A mixture, rapid in penetration so as to enable more sheep to be dealt with in a shorter time, is, however, wanted.

Powder dips when mixed in a proportion of not less than ½ pint to 5 gallons of water have not been found harmful, unless applied while severe cuts from crutching exist. It is necessary to apply carefully and of even strength and to force well into the wool. The lasting properties of powder dips are good. While white spirits of tar instantly destroys the maggots, it soon evaporates and therefore speedily loses its value. It should be used when cleaning with the shears. Smearing mixtures to prevent flies from striking are not always effective; for some evaporate, others dry and adhere to one part and the maggots soon find their way under the preparation and make a home in the new wool.

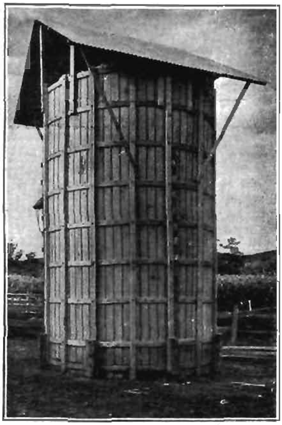
Ewes and weaners of British breeds are more easily treated for they have least wool about the breech. Crutching will allow of better drainage from lamb-raising ewes and more of it will need to be done in future with carefully bred flocks. To be effective, it must be done close to lambing; and, if men are not carefully watched, injury to a percentage of ewes is certain. Many breeders are now advocating a bare pointed Border Leicester type of sheep, but it will not be wise in all cases to go from high class well woolled merinoes to the plain pointed class. Other methods must be looked for before losing our position in this respect.

One of the most practical means will be to prevent the breeding of flies. The effects will be only gradual; but will certainly lessen the evil. Destruction of carcases of rabbits and stock, wherever practicable, will tend to reduce their number. In many cases, expenditure on rabbit poisoning could be better applied, especially if near markets or railways, to encouragement of trapping and increased destruction of harbours. By thus lessening the amount of decomposing material about the country the development of the fly would, in a great measure, be prevented.

A CHEAP SILO.

The maintenance of a uniform milk supply during that portion of the year when the natural pastures fail, can be insured by erecting silos for the conservation of the surplus fodders in spring, which are, in many cases, allowed to go to waste. The present season has been characterized by an abundant production of nutritious grass, so that the milk yield will probably show an increase of from 15 to 25 per cent. The necessity for the erection of silos should be recognised by every thoughtful and progressive farmer so that he will be in a position to combat shortness of supplies should lean years be experienced.

The accompanying photograph is that of a tub silo which came under my notice recently when judging the Alexandra Fodder Crop Competition. It is cheaply constructed and is apparently giving good results. Dairy farmers who are able to procure hardwood timber at reasonable rates may find it to their advantage to adopt this type. The silo, which has a capacity of 70 tons, is on the farm of Mr. D. Kennedy at Thornton. Numerous other silos of the same pattern are being successfully used by dairymen in the district.



TUB SILO AT MR D. KENNEDY'S FARM.

There is no other district in the State where more attention is given to the conservation of green forage crops by means of tub silos than by the farmers along the Upper Goulburn Valley. The particular area starts from the foot of the hill known as McKenzie's, thence to Thornton township, being a stretch of land about 5 miles long by 1 or 2 miles wide. It is skirted on the one side by the Goulburn River and on the other by the main road, and comprises about 2,000 acres. In this small area one may see some 12 silos; and others are being erected.

The luxuriance of the maize grown in the Thornton district this season can be readily realized when one takes into consideration the fact that Mr. Kennedy's 10-acre crop averaged 13 feet in height; see illustration on page 331. Farmers here realize the importance of having a reserve of fodder, in the way of silage, to tide them over the winter.

Silage can be safely stored for any length of time provided the silo is not opened. This fact is of special advantage to dairymen—in years of heavy crops and abundance of natural pastures, the surplus can be stored, thereby insuring that all years will be good years.—*J. M. B. Connor.*

NOTE.—Particulars and dimensions of this silo will be given in the next issue of the *Journal*, in an article dealing with approved types of silos, the erection of which is undertaken by the Department.—EDITOR.

THE SILO: A FACTOR IN MODERN AGRICULTURE.

H. C. Churches, Dairy Supervisor.

One cannot move about the country without feeling sorry at the neglect on the part of many stock-raisers and dairymen, especially the latter, to conserve the surplus fodder visible in all good seasons. Our congenial climate is, in a measure, to be held responsible for this state of affairs. Owners, in the past, have depended altogether too much on Nature to provide for their herds.

Necessity is said to be the mother of invention, but in later times competition has been the impelling influence of many an inventive genius. It is certainly the keenness of competition that is now awakening our rural producers to a sense of their responsibilities. Inertness on the part of dairymen cannot go on much longer. Had our wheat-growers not kept abreast of the times, they would not have been in the envious financial position they are to-day. Economy in production of fodder means increased profits. Competition establishes the price at which the farmers must market their products; but by the study of approved and modern methods they can regulate their profits.

Twenty years ago, few farmers knew what a silo was, and fewer still had ever fed silage to their stock. Silos are no longer a curiosity; they are every day becoming more popular, and many farmers would think seriously of quitting, if they could not have silage for their herds.

The silo dates back to antiquity, but it was not until late in the seventies that their construction was undertaken in this country. They were then mostly of the underground type. To-day, public opinion favours the overhead type, which originated in the United States of America, where it has become very popular. In the principal dairying States of that country the silo is considered an essential adjunct to the dairy farm as is the barn, cow-shed, or other farm building.

ADVANTAGES OF THE SILO.

The many advantages of the silo over other systems of curing crops for the feeding of farm animals are so patent that the naked facts, when once known, are sufficient to secure for it a place in the permanent equipment of a dairy farm. Farmers who contemplate erecting silos, or who are doubtful of their utility, should consult the nearest neighbour who has one. I have not met one owner who did not speak highly of silage as a food for cattle.

It has been said that "whoever makes two blades of grass grow where but one grew before, is a benefactor to mankind." A silo makes it possible to keep two cows where but one was kept before. One of the direct advantages gained by the use of the silo is that it enables growers to have at command a larger quantity of succulent fodder than is possible by any other system.

SILAGE VERSUS DRY FODDER.

Pasture grasses and clovers in a green state form ideal feed for dairy cattle; but they are only available for a few months each year. The same holds true with all crops grown for fodder. The chief method of preservation adopted in Victoria is that of hay-making. It is not customary, however, to dry maize, or to make it into hay. When made into hay, even under the most favourable conditions, all crops lose a considerable percentage of their food value, as well as their natural succulence. The longer they are left in the field the greater is this loss, while in the silo it is comparatively small.

The influence of well-preserved silage on the digestion and general health of all farm animals is very beneficial. It is a mild laxative, and acts in this way very similarly to natural green fodders. An ample supply of succulent feed is of advantage to all classes of farm animals; and more particularly in the case of dairy cows. At the New Jersey Experiment Station it was found that silage, as compared with corn fodder, increased the milk flow by 12.8 per cent. The siloing process is the only known method of providing such succulent food the year round.

CROPS FOR THE SILO.

By filling with such crops as oats and tick beans, or in fact any spring crop, a valuable succulent feed will be at hand at a time when pastures in most districts are apt to give out. Then again, in the southern districts, the silo may be filled with maize in the autumn and fed to the cows throughout the winter. In many districts the silo may be filled twice a year. Should natural pastures be so abundant that silage is not required, it will keep for an indefinite period.

Crops totally unfit for hay-making can be preserved in the silo and changed into a palatable food. This may not be of such importance in a land of plenty like ours, as it is elsewhere. Many forms of vegetation, such as thistles, spear-grass, weeds, &c., which could not be used for cattle food in any other form, may be converted into silage. They do not obtain a higher nutritive content by the process of siloing, but the woody fibre (cellulose) they originally contained, being acted upon by enzymes or bacteria that cause fermentation, is broken down, and the food materials originally contained therein are thereby made more digestible.

PASTURING CATTLE.

Pasturing cattle is an expensive method of feeding, as far as the use of land goes, and can only be practised to advantage where this is cheap. In many places, at present, the land is used only for grazing, and the consequence is that the life of the dairy cow alternates between times of plenty and those of semi-starvation. As land values and rents increase, more stock must be kept on the same area in order to augment the profits. The plough must be used, and here the silo comes in as a material aid. By its adoption, either alone or in connexion with hay, or by the practice of feeding off catch crops, it will be possible to keep twice the number of animals.

A NECESSARY ADJUNCT.

That the silo is a prime factor in modern agriculture is no longer a matter of doubt. It is not the sum total in itself, but it is an adjunct; and, in the case of dairying, a necessary adjunct to successful and profitable methods. Its value is difficult to over-estimate.

If inconvenient to erect a silo, do not turn the cows into the maize, or allow surplus feed to spoil in the paddock. Begin by making stack silage. There will certainly be more waste than if it had been chaffed and stored in an airtight silo; but "better half a loaf than no bread." The cows will think so when the winter sets in. Stack silage is generally the forerunner of a silo.

One of the great advantages of the silo is that, as an innovation, it becomes a stepping-stone to better methods; it stimulates its owner, and spurs him on to see the results he can obtain from his improved system of management. The silo is not an enticing speculation by means of

which something can be got out of nothing, but a sound business proposition. The voices of our best farmers and dairymen sing its praises, because it has helped to square the ledger, brought increased enjoyment to them in their occupation, and pleasure in their homes.

A SUCCESSFUL BALLARAT DAIRY FARM.

A. J. Ross, Dairy Supervisor.

In order to produce a clean and wholesome supply of milk for the retail trade, a great amount of forethought must be exercised. This has been done by the proprietors of the farm under review and they can claim

DWELLING, DAIRY AND DELIVERY CARTS.

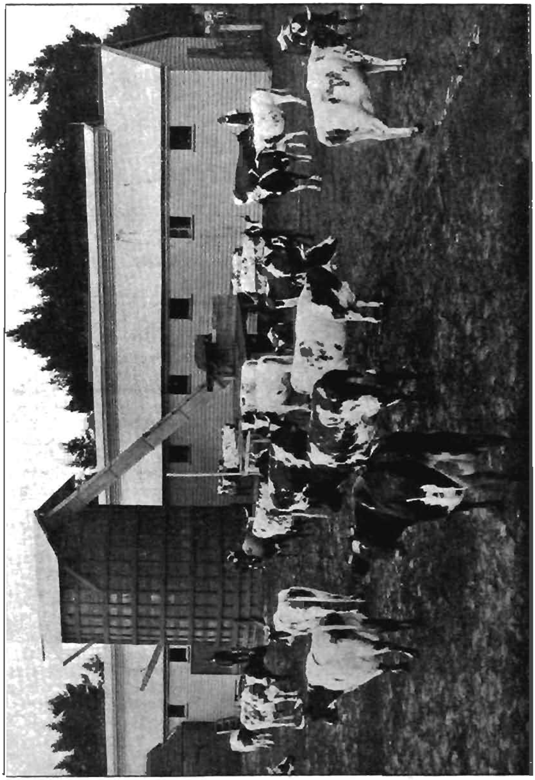
to have been successful in their efforts. The "Roxburgh" dairy farm of Messrs. J. S. Douglas and Son is situated on Smythe's road, 6 miles from Ballarat, from whence milk has been supplied retail for the past 53 years.

Their farm originally contained about 1,500 acres; but 3 years ago 600 acres of timber country were disposed of. The soil is a grey loam and is well adapted for growing rye grass and clovers, in addition to fodder and root crops. About 100 acres are annually cultivated.

THE DAIRY HERD.

The average number of cows milked during 1910 was 105, whilst the average yield per cow for the year was 510 gallons. A Babcock tester is being installed and a better system of culling out the unprofitable cows will be adopted.

Pure Ayrshires form the foundation of the herd. There are at present about 50 representatives, the balance being Ayrshire and Jersey cross with a sprinkling of pure Jersey strain. Several typical Ayrshires are noticeable



DAIRY HERD, SILO, AND MILKING SHED.

in the herd, notably "Goodness of Coolangatta" and "Gracious of Roxburgh." The former is a splendid specimen of the breed, giving 24 quarts in the flush of the season. She has won several champion prizes,

STUD AYRSHIRE STOCK.

1. "Jenny's Pride." 2. "Gracious of Roxburgh." 3. "Goodness of Coolangatta."

besides being reserve champion at the Royal Show for two years in succession. Her daughter, "Gracious of Roxburgh," is also a very heavy milker. She has won several first prizes for best Ayrshire cow and best dairy cow.

The Messrs. Douglas find it a hard matter to dry off some of the cows. They believe in giving each 8 weeks' spell before freshening. Their experience goes to prove that, where cows are fed heavily throughout the season, a prolonged absence from the cowshed is unnecessary. The most striking characteristics of the pure bred in this herd are their colour and general conformation. About 20 heifers from the best cows are raised each year to replace culls from the ranks of the milkers. The principles which govern breeding for dairy purposes, more than those for the show ring, are studied. The balance of the heifers is eagerly sought after by dairymen and other breeders.

FARM BUILDINGS.

The milking shed, which contains 60 stalls, has been built with a view to convenience and comfort for both cows and milkers. There is ample provision made for light, ventilation, and sanitary requirements. Every 6 months the shed is lime-washed and the posts tarred for about 3 feet. The yard is pitched with bluestone and those

adjacent to the homestead are gravelled: whilst all roads leading to and from the shedding are macadamised.

Milking operations are carried out under the personal supervision of one of the principals. The udders are washed and dried prior to milking: the milker's hands are also washed after each individual cow. From the shed to the dairy the milk is taken in covered cans to protect it from flies and dust.

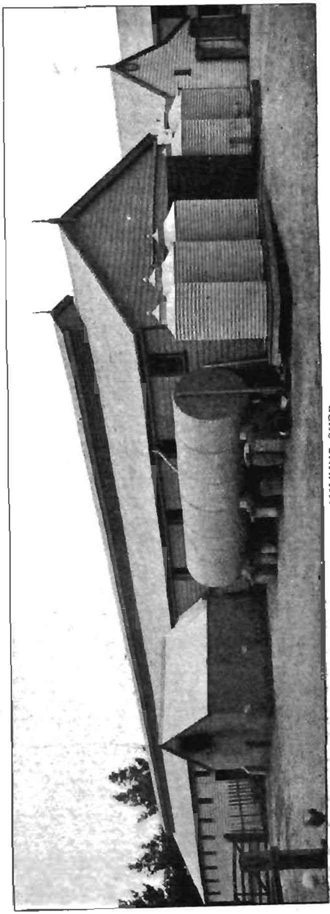
Modern improvements have been adopted in constructing the dairy. The foundation is concrete, and the double brick hollow walls are 12 feet high, the inside being cemented. The floor is made of concrete and the ceiling is plastered. Splendid provision is made for light, ventilation, cleanliness, and economical working.

On arrival at the dairy the milk is run through a Ulax strainer and over a circular cone cooler which reduces the temperature to 60 degs. Fahr. It is then run into the cans and is ready for transit to the city.

All kinds of agricultural implements are to be seen housed at the farm. An oil engine is utilized for chaff-cutting, filling the silo, sawing wood, etc.

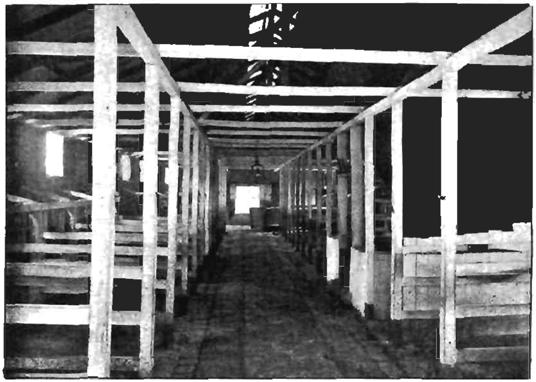
HORSES, WAGGONS, AND CARTS.

Ten horses are employed in distributing the milk. These are bred on the farm. Six draught horses are also kept for ploughing and general work.



MILKING SHED.

Two covered waggons and two covered carts are used for conveyance to and distribution of the milk in Ballarat.



INTERIOR OF MILKING SHED.

FODDER FOR THE HERD.

FODDER CROPS.

All the fodder for the herd is grown on the farm. The Messrs. Douglas are quite satisfied that silage, when the right mixtures are grown, will take the place of the brewers' grains and bran which are at present purchased. This alone will mean a saving of £200 yearly.

The cultivation methods are carried out on scientific principles. The land is worked to a fine tilth and fallowing is extensively practised.

Silage is so highly valued that it is intended to build a second silo of 100 tons capacity. The present one is filled twice each season. A crop of barley, rye, peas or tares and beans is sown in the autumn for summer silage. This season, 5 acres of black oats, in addition, have been sown and are well advanced in growth. There are 20 acres of maize on the farm. At the time of writing some of this crop was 11 feet high and promised to yield about 20 tons to the acre. A splendid sample of cereal silage was then being fed to the herd, the balanced ration being made up by the addition of good oaten hay chaff, bran, and brewers' grains. The cows are fed twice a day for ten months out of the twelve. When an extra supply of milk is required, it has been found necessary to increase the amount of concentrated food supplied to the cows.

WATER SUPPLY.

This is practically artesian. The water rises to the top of the bore and is pumped by windmill to a reservoir which has a capacity of 10,000 gals. From this source it is distributed to cement troughs automatically filled. There are also several large dams for supplying water to the dry stock.

CANDIED HONEY.

F. R. Beuhne, Bee Expert.

All liquid honey is liable, sooner or later, to candy, or granulate; that is to say, it becomes first cloudy and, gradually, partially or wholly solid.

Honey consists principally of two sugars—dextrose and levulose. The former assumes a crystalline form much more readily than the latter; and it is therefore chiefly the relative proportions of those sugars upon which the rapidity and degree of granulation depend.

The preponderance of the one or the other is due to the flora from which the nectar was obtained by the bees. There are, however, some other factors in addition which hasten or retard granulation. These are temperature, amount of water, pollen grains, and air bubbles.

Generally speaking, honey does not granulate until the approach of cool weather; and honey gathered during cool weather candies sooner and firmer than that which is produced in midsummer. Any honey, however, will granulate sooner when subjected to frequent changes of temperature, than when kept at a uniform degree—high or low.

The amount of water naturally present in honey varies according to the source of the nectar, the humidity of the atmosphere at time of gathering, and the length of time it remained in the hives. In Victorian honey it ranges from 12 to 25 per cent. As water is necessary to crystallization, the thinner honeys naturally granulate more readily; while some of the dense honeys produced in the dry parts of Victoria remain clear and liquid for one or two years.

Pollen grains, which are always present in honey, have no doubt some influence in the granulation of honey in acting as nuclei of crystallization. At any rate, it is certain that the honey from those Eucalypts from which bees gather an abundance of pollen, such as Red Gum and Grey Box, granulates very quickly, while that from Yellow Box and Red Box, producing little or no pollen for bees, remains liquid considerably longer.

When the modern method of removing the honey from the combs—by centrifugal force in the honey-extractor—was first adopted, it was soon found that extracted honey candied sooner than strained honey, that is, honey obtained by bruising the combs and straining through bags. This greater liability to granulation in extracted honey is due to the minute air bubbles incorporated during the process of extraction.

Clear honey always realizes a better price than cloudy or congealed; the latter is the trade term for candied. Producers should therefore aim at their honey remaining clear and liquid as long as possible. This can be accomplished by the removal of the factors which hasten granulation, namely, excess of moisture, pollen grains, and air bubbles.

In a moist district, or in any district late in the season, honey should not be extracted until the combs are well sealed over. When extracting the honey, it should be heated to 160 degrees before being poured into a settling tank. This can be done by drawing the honey into open 60 lb. tins, and standing these in hot water until the required temperature is reached. Honey, when hot, is almost as thin as water. Thus, in the settling tank, air bubbles, pollen grains, and fine particles of wax rise to the surface, while a percentage of water is evaporated at the same time.

In some of the larger apiaries an apparatus for heating the honey is inserted between the honey gate of the extractor and the settling tank, to which the honey finds its way by gravitation. It may be drawn off, while still slightly warm, into tins ready for market. Honey thus treated remains liquid for many months, presenting a smooth, clean surface when sampled.

If, when kept for a long time, it does candy, it may be re-liquified, and will not throw up a layer of froth as will honey not previously heated. In liquifying candied honey, great care should be exercised not to spoil it by over-heating. The temperature of the water in which the tins are placed should not exceed 170 degrees. The melting cannot be forced without spoiling the honey. A 60-lb. tin candied solid will take four hours to liquify. By over-heating, the flavour and colour of the honey may be spoiled, and yet a little solid piece remain in the tin, from which granulation again commences almost at once. When many tins have to be dealt with, speed should not be attained by increasing the temperature and reducing the length of time, but by setting a greater number of tins going at the same time.

GENERAL NOTES.

Vintage Returns at Rutherglen Viticultural College.

In the last issue of the *Journal*, particulars were given of the yields for last vintage, estimated at £7 per ton for the grapes. Since writing that article, some of the new wine, less than a month old, has been sold, and the returns show a further advance, which will be appreciated by wine-makers. The highest return for Cabernet, estimated at the value of the grapes, was £32 11s. 8d. per acre. From an area of 1 acre 31 perches of this variety we obtained a 500-gallon cask of wine, and also had about 9 cwt. of grapes over, which we put in with some Malbec, as there was not enough for a separate cask. The 500 gallons of Cabernet were sold at the cellar door at 1s. 9d. a gallon, or a total of £43 15s.

Even then, we do not get the returns we ought to have done; for, owing to the imperfect selection of scions, some of the vines are not as productive as if the wood had been more carefully selected from prolific vines. The results are, however, gratifying, especially when it is remembered that Cabernet is usually a shy bearer.

In the recent vintage we made a greater quantity of wine to the ton of grapes than ever before. The average for the whole vineyard was 162 gallons to the ton of grapes and 500 gallons per acre of vines. With such returns viticulture pays handsomely.—*G. H. Adcock.*

ANSWERS TO CORRESPONDENTS.

The Staff of the Department has been organized to a large extent for the purpose of giving information to farmers. Questions in every branch of agriculture are gladly answered. Write a short letter, giving as full particulars as possible, of your local conditions, and state precisely what it is that you want to know. ***All inquiries forwarded to the Editor must be accompanied by the name and address of the writer.*** *This is very necessary, as sometimes insufficient information is furnished by the inquirer.*

ESTABLISHING GARDEN.—A.B.C. states that he intends to establish a garden—flower, vegetable, and orchard—and plant fodder crops on some land which he holds. The soil is deep sand which grows a very little grass amongst ferns. It is on a rise and is consequently well drained. Water, lime, loam, clay and stable manure are available.

Answer.—The land should be lightly ploughed, or skimmed, to loosen the ferns, which should be harrowed out and burned: as much fern growth as possible should be removed. The portions intended for flowers, vegetables, and fruit should then receive a good surface dressing of clay and stable manure. This should then be deeply ploughed in. If ploughing is not practicable, then the clay and manure should be trenched in. If vines, oranges, or lemons are to be grown, and provided frosts are not prevalent, they thrive well on sandy soils, and no clay need be used at all. Before advice can be given *re* fodder crops, trees, &c., it should be definitely stated for what purpose these are required. For instance, if fruit trees are needed, it should be stated whether a commercial, or merely house, garden is required.

IRRIGATION.—B.L. proposes to irrigate 15 acres of rich, black soil to grow rape, maize, and lucerne. The highest point is 30 feet above the water and 120 yards distant. He wishes to know the volumes of water required and the power of plant necessary.

Answer.—(1) The volume of water required per acre for irrigation varies with the season, the crop and the soil. For soil of the class described, the first watering in early summer will probably run to 250,000 gallons, the second to 150,000, and the remaining ones may be kept down to 100,000, with an efficient system of distribution. Lucerne will benefit by four or more waterings. Maize and rape require three at least. The seed bed should be watered prior to sowing should it not be naturally moist. (2 and 3) The power of pump and size of pipes depend upon the period within which it is desired to complete one watering. A suitable plant would consist of an 8 B.H.P. oil engine and a 4-in. centrifugal pump. (4) The cost with necessary piping at Melbourne would be approximately £220. Both engine and pump should be guaranteed by the vendors.

SILO ELEVATOR.—A.H.D. doubts whether a 4 B.H.P. oil engine will drive a silo elevator as well as a chaffcutter. He proposes to put up a 12-feet silo, 6 feet in the ground, and to put cutter on platform 6 feet high, doing away with the necessity for elevator.

Answer.—The additional work caused by the use of an elevator is very little, probably not more than ½ h.p. A 4 B.H.P. engine is, however, probably fully loaded driving a three-knife chaffcutter. There is no objection to the proposed method of construction of silo, provided the inner face is continuously smooth and has no break at ground level preventing silage settling.

FILLING SILO.—A.H.D. asks what would be the capacity of a silo 12 feet high and 15 feet diameter. He also desires to know what weight should be put on it when filled, and whether it should be filled again after settling.

Answer.—The capacity would be about 40 tons of 50 cubic feet. To weight the silo, with its comparatively low height, at least 4 tons in stones, logs, or sand-bags should be applied on top of a well soaked layer 12 inches thick of chaffed straw or other useless material. If well trampled while filling, settling should be trifling.

CONCRETE AND BRICK FLOORS.—A.H.D. asks for directions to construct concrete and brick floors.

Answer.—The ground should be excavated as necessary and levelled to the required grade; if filling is used this must be thoroughly rammed after formation and stand some time before concrete is placed on it. On this surface lay 2 inches of sand, on which, when well wetted, the concrete is to be laid to a depth of 5 inches. The concrete is to be composed of—

1 part cement	or	1 part cement,
2 „ clean coarse sand,		3 „ sand,
2 „ screenings,		5 „ 2 inch metal.
3 „ 2 inch metal;		

The concrete should be laid in strips 6 feet wide and 8 feet in length or similar suitable dimension, the sections being separated by battens which are afterwards removed and spaces filled with cement mortar composed of 1 part cement to 3 parts sand. Before concrete is set, the face of concrete should be rendered ½ inch thick with cement mortar composed of 1 part cement and 2 or 3 parts of sand. The rendering may be omitted for cow shed floors, care being taken in ramming to bring up the compo. (sand and cement) well through the metal so as to make a fairly smooth surface.

All mortar and concrete should be mixed on a wood platform and proportions carefully gauged with a box. The concrete should be turned over twice dry and then water added through a rose while being again turned over twice. Concrete should be mixed as near final position as possible and must be used at once; under no circumstances is it to be allowed to stand after being mixed. Care should be taken in ramming not to keep it up longer than the commencement of setting. Any old work, including that finished the previous day, must be well wetted and picked over to form a bond before adding fresh cement.

If a brick floor is used, the bricks must be hard, well burnt bricks. Bricks to be laid on edge or flat on 1½ inch bed of sand and grouted with cement mortar composed of 1 part cement and 2 parts sand. The bricks may be laid ¼ inch to ½ inch apart.

It may be roughly reckoned that one barrel of cement will make 1 cubic yard of concrete, consequently it will give 9 square yards of flooring at 4 inches thick, 7½ at 5 inches, and 6 at 6 inches thick. For grouting, much depends on the spacing, depth of filling, &c., but one barrel should cover 10 to 20 square yards or even more.

WARTS ON MUZZLE.—W.E.H. states that he has a two-year-old filly whose lips are covered with warts.

Answer.—The warts on your filly's muzzle are a common affection of young horses, and usually disappear of their own accord. The large ones may be snipped off with scissors; smearing the parts with castor oil will hasten recovery.

FEEDING SOW WITH LITTER.—J.D.M. asks what is the best food for sow with litter. He has been feeding on pollard and milk with a little half-ripe maize, but this appears to scour them.

Answer.—After farrowing, the sow should be immediately given half a teacupful of castor oil in warm milk. Then feed with crushed wheat or barley boiled or scalded and mixed with milk. After a week has elapsed some green maize or other fodder, such as rape or lucerne, may be given. Keep charcoal and rock salt in pen. Provide a good warm bed of short straw.

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REVIEW OF THE VICTORIAN DAIRYING SEASON AND BUTTER EXPORT TRADE, 1910-1911.*

R. Crowe, Superintendent of Exports.

The recent dairying season has proved a record one, the total oversea export of butter to 30th June having reached 24,293 tons. To this must be added a further 1,500 tons representing our Inter-State exports (almost wholly Western Australian). The grand total is 25,793 tons, valued at £2,666,265. The previous record was for the season 1906-7, when 21,562 tons, valued at £2,156,200, were exported. In that year we had over 700,000 dairy cows, whilst for 1910-11 it is estimated that the number was some thousands less.

The season began well, and was crowned by timely summer rains which prolonged the period of lactation in the dairy herds. Commendable efforts were made to provide summer and winter fodder for dairy stock; and it is sincerely to be hoped that the wisdom of embracing the present opportunity to guard against future possibilities of shortage will not be overlooked. In the district where most headway is in evidence, as regards the growth and conservation of fodder, a couple of years ago almost every head of stock was lost for the want of it. When visiting this locality recently I counted 20 silos during a short drive. On many farms there were two, whilst at one, three were erected side by side. At the same time, there were farmers who had so far done nothing in this direction. Even in this district there is room for the manifold multiplication of silos.

Every butter-exporting State in the Commonwealth showed a corresponding improvement in production, the rate of increase over last season being almost the same in each State. *Victoria has kept to the fore by contributing about half of the total butter exported from the Commonwealth.*

PRICES.

Considering the very large quantity of butter shipped from Australia to the United Kingdom, prices have been most satisfactory.

* Paper (abridged) read at the 18th Annual Conference of the Butter and Cheese Factories' Managers' Association.

I have not been able to procure the highest actual average price realized, but expect it to be in the neighbourhood of 110s. a cwt. In computing the value of the total butter exported the average is placed at 105s. for the season. Considering the great increase in exports, this compares well with 112s. for last season, 112s. for 1908-9, 115s. for 1907-8, and 100s. for 1906-7.

Towards the end of the season, when the price hovered in the vicinity of 100s., many dairymen were somewhat pessimistic, but they may be reminded that this season followed three of the most phenomenal in regard to high prices. Hence, by comparison with recent seasons, rates which appear low, when contrasted with those of many years ago, are most satisfactory. It is surely better to have 25,000 tons of butter for export, with a selling value of £2,666,000, than only 15,000 tons with a value of £1,680,000.

The quality of the butter has been favourably commented upon from abroad.

Grading.

Judging by the few complaints received, factory managers are satisfied with the verdicts awarded the butter. In a couple of cases, however, brooded grievances have recently come to light. I would like every factory manager to immediately write when he considers that he has any grounds for protest, so that an opportunity may be given his agent or representative to see the butter on his account. The city factories avail themselves to the full of the privilege of reviewing the graders' decision with the result that a much better understanding now exists than formerly.

From the London importers' point of view complete satisfaction has been given, and quite recently one authority remarked that our Government grade certificates were now regarded on a par with Bank of England notes. Another stated that, although his transactions during the past season assumed very large figures, he had not received a solitary complaint. He made forward sales on a gradually faling market, and buyers lost up to 10s. per cwt. Thus, if there had been the slightest weakness, he concluded that it would have come to light. Only one complaint was received from London. Upon investigation, this was found to be groundless.

It has recently been pointed out that brands should be cloaked whilst the butter is being graded, so that the grader may not be even unconsciously biased. Attempts have been made to do this on different occasions. It was only possible to do so when the quantity of butter to be examined was very small, say, at the beginning, or towards the end of a season. When the number of boxes requiring examination became numerous, the work of cloaking proved too cumbersome.

In grading butter it is necessary, in addition to its flavour and texture, to take into account its condition, for which points are awarded. Condition covers packing, finish, and general appearance, so that the parcels of butter have to be seen as a whole by the grader when awarding points, or determining the grade. The top of the butter is usually stamped with the name or trade mark of the manufacturer, so that if the brand end of the boxes were hidden, the purpose in such instances would not be served.

Considering the magnitude of the business, the decisions queried have been very few. If received before the butter was shipped, every facility was afforded the manufacturers or agents to see it in company with the grader.

Rather than incur the expense that would be involved by the "cloaking" suggestion, I would recommend that provision be made for disputed verdicts to be settled summarily by arbitration. The trade could nominate two or three outside experts, one of whom would always be readily available, and managers of factories could advise their agents of the score expected by them. Failing official agreement, a formal protest could be lodged and the matter settled forthwith.

Churn Marks.

Hitherto, the method of churn-marking was left to the discretion of butter factory managers themselves. Letters or numbers on the boxes or a combination of both with a rubber stamp were suggested. So confusing was the result that it has been most difficult to identify and record some of them. As a uniform practice must be adopted it is suggested that numbers only be employed to indicate the number and date of each churning.

The figure "1" placed over the number "16" would signify the first churning of the 16th of the month; the figure "2" over the 16, the second; "3" over 16, the third of that date; and so on.

Brands and Marks.

Attention is directed to the want of uniformity in brands, especially as to "Unsalted," "U.S.," churn and shipping marks. When the boxes from the various factories come together it is anything but pleasing to see the various colours employed. Different shades of red and brown predominate whilst some are black. In future, it will be necessary to have all brands in some dark colour other than red. This is provided for in the regulations which come into operation next season.

My attention has been called to the necessity for some more distinctive brand for unsalted butters, and I am led to the opinion that the best solution of the difficulties usually encountered under the present system would be to employ separate brands altogether for unsalted from those used for salted butters.

Butter Boxes.

Many factory managers are to be commended for the way in which they see to the handling of their boxes. A gradual falling off in care was apparent, however, towards the end of the season. Some boxes showed evidence of being placed on the ground or on unclean lorries. Straw should be first shaken on the bottom of the cart or waggon, and also on the floor of the railway truck. Attention to points like this will be well repaid.

Finish.

As with the branding and care of the boxes, so with the finish is strict attention necessary. Slovenliness in regard to butter is beyond pardon—the strictest attention to detail must be observed. Thin square slips of paper improve the top of the butter before folding over the lining. An excellent advertisement sometimes employed is in the form of a slip of good quality butter paper—not too heavy—bearing the factory's trade mark and the company's name, describing our genial climate, the beautiful condition under which the cows pasture, the care exercised in the making of the butter, and so on.

Another way of finishing the top, which is coming into fashion in New Zealand, is by turning in the corners of the last two linings folded over,

and fastening them in the centre with a tag or seal containing a neat emblem. That this would convey an impression of extreme care and daintiness on the part of the maker and packer is obvious.

Judging by the finish and the brands, the rollers used in a number of factories have passed their period of usefulness and should be immediately replaced.

MOULDS ON BUTTER.

Towards the latter end of the season, moulds on the surface of the butter became frequent, and this was attributed to the use of unseasoned timber. Box manufacturers did not anticipate such a phenomenal season and had to secure unseasoned timber. Under such circumstances, however, managers should have paraffined their boxes before use.

In every case that came under notice, factories were immediately communicated with, and a leaflet on the cause of moulds on butter forwarded. The necessary precautions were indicated, whether the origin was due to carelessness with the butter paper or green wood.

BORIC ACID.

The average boric acid contents of samples analysed (exclusive of those tested for freedom from boric acid) were 0.196. The figures for the preceding years were 0.18 per cent., 0.17 per cent., and 0.23 per cent. respectively. Nine consignments, representing 194 boxes and containing more than 0.5 per cent., were withheld from shipment, until the percentage was reduced. The number of boxes so held up during the preceding year was 388. These contraventions were certainly due to laxity. Every butter maker can control boric acid contents by carefully estimating and weighing the quota to be added to his butter. If measured by rough and ready means risk is inevitable. *Even distribution* is required to avoid portions of the churning being overloaded.

BUTTER FAT.

The average percentage of butter-fat and casein combined was not taken out in the usual way, and only samples the other analysis of which indicated low standards were tested. The average for the preceding years respectively was 83.71 and 84.65 per cent. There were 45 contraventions representing 1,697 boxes. This butter was prevented shipment until its composition had been amended. The average casein contents are about 0.75 per cent.

SHORT WEIGHT.

Sixty-two consignments representing 3,276 boxes were intercepted from shipment on account of short weight. By checking these packages 2,329 were passed as correct and released, the remaining 947 boxes having had their contents amended under supervision before export. 610 boxes were found short in weight for the previous year out of consignments representing 2,100 boxes.

In future it will be necessary for boxes which are marked "56 lbs.," or "56 lbs. net," to contain not less than 56¼ lbs. of butter exclusive of the paper, at the place and time of official checking. Any boxes containing between 56 lbs. and 56¼ lbs. will require to be branded "Bare weight."

MOISTURE CONTENTS.

One hundred and five consignments representing 3,857 boxes were discovered with butter having over 16 per cent. moisture. These do not include the number held temporarily, and subsequently released as the

result of a second analysis. The whole of this butter was re-worked under supervision and brought up to standard. The previous season's figures were 2,107 and 776 boxes respectively. As the standard will be reduced to 15 per cent. next season, considerable attention must be given in order that the desired end may be accomplished.

The following table shows the average moisture contents of the 6,486 samples of butter analysed under the Commerce Act:—

Mean average:—13.82 per cent. against 13.97 per cent. for 1909-10 and 13.69 per cent. for 1908-09.

District.	Average.	Co-operative.	Proprietary.
	Per cent.	Per cent.	Per cent.
Western District	14·0	13·83	14·47
Gippsland	14·09	14·10	14·06
North and North-East ...	14·08	14·03	14·10
City factories	13·71	...	...

The average for July butters was 13.31 per cent., August 13.21 per cent., September 13.5 per cent., October 14.6 per cent., November 13.2 per cent., December 13.6 per cent., January, 14.1 per cent., February 14.7 per cent., March 14.47 per cent., April 14.3 per cent.

It must be borne in mind that the mean average of 13.82 per cent. was the result of all the samples analysed, and, as particular attention was paid to those found close up to the limit, a larger number of them was included, so that these figures do not accurately reflect the moisture contents of Victorian butter. It will be recognised that, under the circumstances, the real average would be somewhat lower.

During the season it was discovered that the second sample taken at the request of exporters sometimes gave lower moisture results than the first, and consignments held up on account of the first analysis were subsequently released as a result of the second test. It was the exception rather than the rule for the second result to come up to and confirm the first. When the results, accompanied by the graders' remarks, were tabulated, it was observed that butters in which free moisture existed at the time of examination showed a greater discrepancy than those in which no free moisture was detected. A careful investigation has been made and many experiments conducted to ascertain the cause. A number of butters, dry in appearance, were specially selected and analysed for comparison with some exhibiting free moisture. The first sample was taken at the usual time when the butter was fresh after arrival at the Cool Stores. The second set of samples was drawn from the same boxes when the butter was chilled or frozen, and the third after thawing, with the following result:—

Condition of Butter.	No. of Sample.	Average percentage Moisture Contents.		
		Samples taken when Grading.	Samples taken when Chilled.	Samples taken after Thawing.
		Per cent.	Per cent.	Per cent.
Dry appearance	7	15·214	15·25	15·435
Showing free moisture ..	12	14·00	13·316	13·883
Dry appearance	8	Reported excessive	16·35	16·5
Showing free moisture ...	4	Reported excessive	14·95	16·75

From the above tests it will be seen that the apparently dry butters, upon analysis, proved to be wet in comparison with those showing free moisture. In addition, it was clearly evidenced that the samples taken when the butter was in chilled or frozen condition did not give full results. In future, therefore, the second sample will not be procurable until the butter is brought up to a normal temperature, and not less than 24 hours will be required before the sample can be drawn, after approval is secured.

The moisture contents of 160 samples were taken out in duplicate with evaporation and flame tests respectively. The flame test gave higher results; the average difference was 0.285 per cent. Another set of 12 samples was tested in duplicate to find the difference, if any, between taking a test sample from butter when in the ordinary condition, and emulsified. The results were practically the same. The ordinary samples gave 14.921 per cent. against the emulsified, measured when in liquid form, of 15.008 per cent. It would appear that, from a factory manager's point of view, a sample taken from the butter and weighed in its original form should serve his purpose.

Some years ago experiments were carried out by officers of the Department in various districts of the State to ascertain the reason of the variation in moisture contents, and to discover some method of controlling it. These experiments established the necessity of low churning temperatures, first of all to recover the maximum of butter fat from the cream, and secondly to produce a butter of reasonable moisture content.

Under the latter heading it was found that the exact degree of temperature did not of itself assist in the determination with regard to the subsequent moisture. The relative temperatures of the cream and of the rinsing water used in the churn exercised a greater influence in reference to the variation. A high moisture content could be secured by using rinsing water of some degrees higher in temperature than the cream, whilst the minimum resulted from the use of water of the same temperature. Again, by not stopping after adding salt and preservatives until the product is finished the maximum of moisture is retained. The stoppage for half a minute once, or better still, twice, during working will permit the expressed moisture to drain away instead of some of it being re-incorporated.

It will therefore be seen that there are three controlling factors, and that, given due attention, the moisture contents *can* be kept within reasonable limits. The first is to have the cream reduced to a uniformly low temperature, the second to have the rinsing water used in the churns of the same degree of heat as the cream; and thirdly, to permit draining to take place at intervals during the process of working. With factories making different grades of butter, the majority of the contraventions against the standard for moisture related to the lower grades.

Of the 164 contraventions for non-compliance with standards as regards composition, 3 or 1.8 per cent. was pastry butter, 24 or 14.5 per cent third grade butter, and 86 or 52.4 per cent. second grade. A total of 69 per cent. was thus below the first grade standard.

The moisture contents of 6 per cent. of the samples were below 13 per cent.; 19 per cent. of the samples between 13 per cent. and 14 per cent.; 47 per cent. of the results between 14 and 15 per cent.; 25 per cent. of the samples between 15 per cent. and 16 per cent.; and 3 per cent. of them over 16 per cent. The average moisture contents of unsalted butter were 14.48 per cent., and of salted butter from the same factories 14.12 per cent. There was therefore a difference of 0.36 per cent. more moisture in unsalted butter.

There was a pronounced increase in moisture contents with a great many factories after the beginning of a spell of heat. On such occasions it was greater than during a prolonged period of hot weather. This seems to indicate that many managers permit themselves to be taken on the hop, and do not use their refrigerators as often or as soon as necessary.

Payment for Cream according to Grade.

A matter which still remains unsettled because of the nature of the competition which exists for it, is the grading of, and payment for, cream according to grade. It will be remembered that a conference of factory managers, directors of co-operative butter factories, and secretaries, recommended that this should be made the subject of State regulation. This has yet to be done, and is promised at the earliest opportunity. The Trafalgar Butter Factory Company has, I understand, decided to adopt the system, and a few other factories have embraced this policy, but it is hardly likely to become general until it is made mandatory.

Regulating Over-run.

Over-run is another matter which might be discussed by this Association. It becomes, indeed, a burning point when neighbouring factories are in competition, and one which should, in some manner, be controlled. So long as a factory's operations are confined within certain limits, the exact percentage of over-run is immaterial, or rather takes second place to the question of equitable reading of the test. If the over-run be equally high all round, and the factory a co-operative one, suppliers get paid at a higher rate per lb. of butter fat credited per test, although less than delivered; whilst with a low over-run, the suppliers get a larger number of lbs. of butter fat credited to them and a lower price per lb.

But when a factory competes for supplies against another, one giving a high over-run and the other a low one, the question assumes a different complexion. If tests are read finely so that suppliers are credited with 98 lbs. of butter fat for every 100 actually delivered, and a neighbouring factory manager reads the test flush, so as to credit suppliers with 103 lbs. of butter fat for every 100 lbs. actually delivered, the suppliers will get less at 1s. per lb. in the one case than at 11½d. in the other. One shilling per lb. for 98 lbs. of butter fat (representing the 100 lbs. as above mentioned) means the purchasing of 100 lbs. for 98s., whilst 103 lbs. (on the conditions previously quoted) at 11½d. means the purchasing of 100 lbs. of butter fat for 98s. 8d.

In some parts of the world, when the composition of milk is below a stated standard, the law presumes that it is adulterated until the contrary is proved. Other countries are at the moment considering whether any over-run larger than 15 per cent. should raise the presumption that payment has not been made on the full test, the manager of the creamery being expected to explain the abnormality. This could be easily regulated by factories submitting a certified copy of detailed monthly operations for official checking.

Milking Machines.

The use of milking machines has been considerably extended during the past season; and, owing to the scarcity of suitable labour on dairy farms, their adoption may be expected to become even more general. It is advisable, therefore, to emphasize that the utmost care and cleanliness are necessary. A haphazard method of dealing with rubber tubes and

fittings cannot be tolerated. Greater care is necessary with these machines than is the case with the ordinary pail; but, given that extra intelligent attention, milking by machinery should not detrimentally affect the quality of the product. It is advisable to cleanse the cows' teats before attaching the milking cups and to carefully strip every cow after the machine is detached to see that no milk has been left behind. Animals regarding which there may be any suspicion should be hand-milked. With these precautions, the machine will answer every purpose.

CHEESE EXPORTS.

Four shipments of cheese were made during the season, and a very high reputation has been established, which I attribute largely to the good work done by the Cheese Instructor (Mr. G. C. Sawers). The first report from the Agent-General compares the quality favourably with that of the Canadian article, and no higher compliment could be paid to it.

In a flush fall of the season, such as was experienced this year, cheese for export finds from January onwards a much more profitable market than rules for butter. It is expected that, with the progress of dairying in Australia, New Zealand, and other parts of the world, the Inter-State markets will not absorb from Victoria the same quantity of butter as in past years. Therefore, it may be anticipated that many companies will instal cheese-making plants in order to turn their milk to the best advantage.

* * * * * * *

In the discussion which followed the reading of the paper, the information given below was furnished by Mr. Crowe:—

The average composition of Victorian butter, in round numbers, for the previous season was 83 per cent. butter fat, 14 per cent. moisture, 2 per cent. salt, 0.75 per cent. casein, and 0.25 per cent. boric acid. The over-run represented the constituents of butter other than butter fat.

An over-run of from 13 per cent. to 15 per cent. should be regarded as reasonable where a milk supply was dealt with, whilst with a cream supply the over-run should range from 15 per cent. to 17 per cent. That is to say, when dealing with milk, every 100 lbs. butter fat estimated in the milk per Babcock tester should make from 113 to 115 lbs. commercial butter; and, with cream supply, from 115 to 117 lbs. of commercial butter.

The manufacturing losses would be from 3 per cent. to 3½ per cent. with a milk supply, and from 1 per cent. to 1½ per cent. when handling a cream supply. These losses consist of the unrecoverable butter fat in skimming, churning and manipulation in all the other utensils, together with the increased weight packed in boxes at above the net weight marked on them. No skimming losses have to be provided by the manufacturer when receiving cream. His losses in the latter case only count from that stage on, hence the difference between the two classes of supply. In treating milk and producing a butter having 83 per cent. butter fat, it requires about 86 lbs. of butter fat to produce 100 lbs. of commercial butter; with cream, it would take about 84 lbs. butter fat, estimated per Babcock tester.

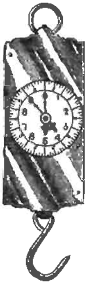
THE BABCOCK TESTER ON THE FARM.

R. T. Archer, Dairy Expert.

Sufficient has been written to prove the necessity for the farmer being able to use the Babcock tester; also to test cream and separator milk, to ascertain whether or not it pays to feed and milk the individual cows in the herd. The object of this article is to explain the correct method of working this invaluable appliance.

To insure satisfactory results it is necessary that a correct sample be obtained—a sample that represents correctly the composition of the bulk. The method of sampling milk generally adopted in butter or cheese factories is what is known as the drip system, in which the milk runs along a chute from the weighing tank to the vat. A hole is punched in the bottom of the chute through which the milk drips while it is running along the chute. A vessel is placed to catch the drip and a little of it is put into a bottle. This is repeated with each delivery. A little formalin is put in with the first lot to preserve the sample until the end of the week when it is tested.

1. SIX-BOTTLE BABCOCK TESTER.



2. MILK SCALES.

TESTING COWS.

Taking the sample.—Strip the cow thoroughly dry. Weigh the milk *on the scales (Fig. 2), which should be hanging in a convenient place, and note the weight on the ruled sheet* (Fig. 3). Pour the milk from one* bucket to another three times and immediately take 1 c.c. (cubic centimetre)

* Record sheets may be obtained from the Department of Agriculture, Melbourne, at 6d. per dozen, post free. When ordering, applicants should state whether the weekly or monthly sheets are required.

for every pound of milk there is, and place in the sample bottle; *i.e.*, if there are 25 lbs. of milk take 25 c.c. into the sample bottle. Put into this three drops of formalin (40 per cent. solution) and mix by giving a gentle

MONTHLY CHART.
for the guidance of Dairymen in recording each Cow's Milk.

NAMES OF COWS.																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE	LBS. MILK	LBS. MILK	LBS. MILK	LBS. MILK	LBS. MILK	LBS. MILK	LBS. MILK	LBS. MILK	LBS. MILK	LBS. MILK	LBS. MILK	LBS. MILK	LBS. MILK	LBS. MILK	LBS. MILK	LBS. MILK	LBS. MILK	LBS. MILK	LBS. MILK	LBS. MILK	LBS. MILK	LBS. MILK	LBS. MILK	LBS. MILK
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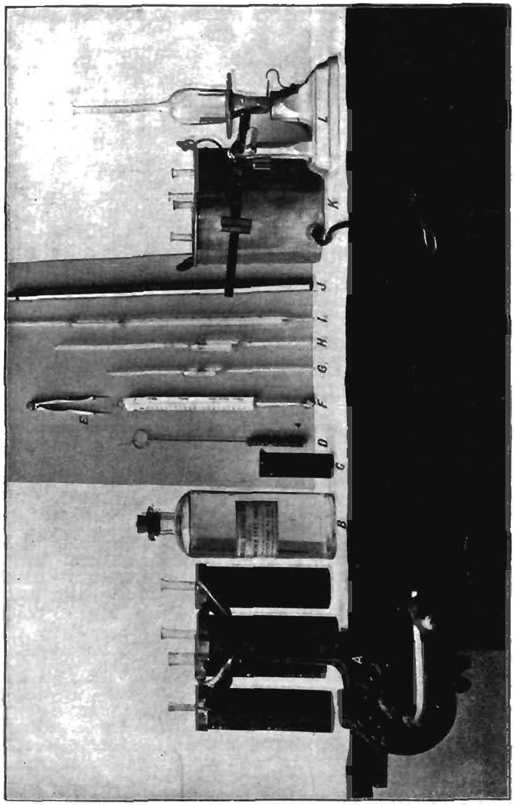
TESTS. AVERAGE																								

3. RULED SHEET FOR MILK RECORDS.

rotary shake. Repeat this for six consecutive milkings, except that the three drops of formalin already added will be sufficient for the whole sample. As each fresh lot of milk is added it should be mixed by shaking

with a gentle rotary motion. The sample should not be shaken violently at any time or the cream may be churned, and this would make the testing



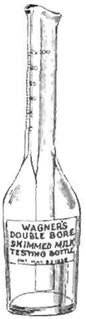
4. FARMER'S TESTING OUTFIT.

a, Four-bottle Babcock tester; *b*, Sulphuric acid; *c*, Acid measure; *d*, Brush for cleansing flasks; *e*, Compass; *f*, Thermometer; *g*, 8.8 c.c. pipette; *h*, 17.6 c.c. pipette; *i*, 50 c.c. pipette; *j*, Milk thief; *k*, Hot water bath; *l*, Cream scales.

difficult. The sample must be kept tightly corked. The three drops of formalin added to the first lot should keep the sample sweet until it is convenient to make the test.

Making the test.—When the milk has stood for a few days, the cream will have risen to the surface and become tough and leathery, and will not mix thoroughly by shaking until it is heated. Stand the sample bottle in water, 100 to 110 degrees Fah., until the cream is softened; then agitate gently until the cream is thoroughly mixed with the milk, no small lumps remaining. The milk must then be cooled to between 60 and 70 degrees Fah., which is the correct temperature to mix the milk and acid in the flask, both being as nearly as possible the same temperature.

Now take 17.6 c.c. milk, giving the sample a shake first, and run this into the flask; to this add 17.5 c.c. sulphuric acid. When running in the milk and acid, hold the flask in a slanting position and allow the liquid to run gently down the inside of the neck. Shake the flask with a rotary motion until all the curd (casein) is dissolved. Place the flasks in the machine so that they balance and rotate for five minutes at the speed indicated on the machine. Fill up to the bottom of the neck with boiling water, run for two minutes more, fill to within ¾ inch of the top of the neck with more boiling water, run for one minute, take the flasks out of the machine and stand in a water bath (Fig. 4*k*) at 140 degrees Fah. for a few minutes. Then read off the tests. The butter fat should now be separated and collected in a clear compact column, like olive oil, in the neck of the flask on top of the water.



5. MILK TEST BOTTLE. 6. CREAM TEST BOTTLE. 7. SKIM MILK BOTTLE.

Reading the test.—By the illustration (Fig. 5) it will be clearly seen how the flasks are graduated. Each division marked by long lines and numbered, represents one per cent., and each division between marked by short lines equals .2 or two-tenths of one per cent. It will be easy to measure to one-tenth of one per cent., or half one of the small divisions. With the compass (Fig. 4*e*) the full length of the fat column is taken where the fat comes in contact with the glass (Fig. 8).

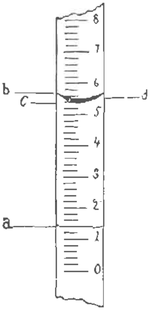
It will be noticed that while the bottom line of the fat column is straight and distinct the top shows a meniscus or hollow, and one may be in doubt how to take the measure. This should be the full length of the column where the fat is in contact with the glass, or, as is shown in the illustration, measure from *a* to *b*—not to *c* or *d*. Measure the fat column with the

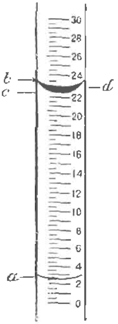
compass; place one point on the zero and see how far the other point reaches. This will show how many spaces the fat fills, and the reading gives the correct percentage of fat in the milk.

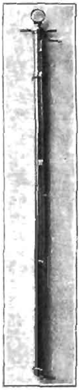
Calculating the result.—The weight of the milk given by the cow, multiplied by the test and divided by one hundred, gives the amount of butter fat in pounds. To convert this approximately into commercial butter, one-sixth is added to the fat result.

Example.—35 lbs. of milk at 4.2 test $= 35 \times 4.2 \div 100 = 1.47$ lb. butter fat $+ \frac{1}{6} = 1.715$ lbs. (practically $1\frac{3}{4}$ lbs.) commercial butter.

Sulphuric acid.—The sulphuric acid should be a definite strength, *i.e.*, 1.827 specific gravity. It is usually supplied by the agents at the correct strength. Care must be taken in handling it as it is very corrosive. The appearance of the fat, when the test is completed, will indicate if the acid is the correct strength or not. Instead of being a clear amber coloured column it may have black or white specks mixed through it. Black specks may be caused by the temperature of the milk or the acid being too high when mixed, or too much acid being used, or the acid being too strong.







8. READING MILK TEST. 9. READING CREAM TEST 10. CREAM SAMPLER.

It will be easy to discover in this way if the acid is too strong. If so, use one or two c.c. less; if the fat comes out clearly, it will be correct. On the other hand there may be white specks of undissolved curd in the fat column. This may be due to temperature of milk or acid being too low when mixed, too little acid being used, or not shaking sufficiently to dissolve all the casein when mixing; this is particularly so if too much formalin has been used in the sample, or the acid is too weak. If not much too weak, one or two c.c. more acid may bring the test out clearly, when the results should be correct. If the stopper is left out of the bottle the acid will absorb moisture from the air and so become weaker. The acid should be water white, but sometimes, through dust getting in or through other reasons, it turns dark; if you get a clear reading of the fat the acid will be all right. Do not dilute by adding water.

Testing Cream.

Sampling.—If the cream is fresh and liquid enough to pour freely the sample may be taken by pouring from one vessel to another three times and immediately dipping a small quantity into a bottle; add three drops of formalin, and cork tightly to prevent evaporation of moisture. If left in an open jar, especially in hot weather, evaporation takes place rapidly and this would increase the test, causing inaccurate results.

If the cream has set, as it does when it is thick and ripe, the sample must be taken with a Wheal sampler (Fig. 10). This cuts a complete core from top to bottom of the can giving an accurate sample and an aliquot part of the cream. The whole syringeful is taken into the bottle. The cream should be separated to contain between 40 and 50 per cent. fat; then there should be no difficulty in getting a correct sample. When liquid enough the cream may be mixed by means of a plunger, consisting of a saucer-shaped disc attached to a rod.

The Wheal sampler is like a syringe, and the piston must be kept tightly packed so that, when the thumb is placed on the open end of the tube and the rod drawn out to its full length, a complete vacuum is created: on releasing the rod it runs right back to the thumb.

Making the test.—The Babcock test is based on the assumption that 18 grammes weight of the material to be tested is delivered into the flask. A 17.6 c.c. pipette will deliver 18 grammes of milk into the flask; but, with cream testing 40 to 50 per cent. fat, 17.6 c.c. would only weigh 15 to 16 grammes on account of the difference in the specific gravity. It is therefore provided by law that cream shall be weighed directly into the flask.

For this purpose sensitive scales are used (Fig. 4 *b*). These are obtainable for about 25s. The sample bottles should be stood in water, 90 to 100 degrees, until liquid enough to run freely. The flask is then balanced on the scales; approximately by the counterpoise on the beam, then by small shot or pellets of paper on the tray. The weight is moved along the beam to the 9 gramme mark, and cream (being thoroughly mixed) is run in with a pipette until the weight is balanced. If a drop too much is run in it may be removed by a fine tube which can be inserted to the bottom of the flask. Nine grammes of cream, instead of 18, are taken because our flasks (Fig. 6) are graduated to 30 per cent., and the fat of 40 per cent. cream would not all go into the graduated neck. Nine c.c. of water are then run in. After adding 17.5 c.c. sulphuric acid, shake until the casein is all dissolved. There is a frosted spot on the flask on which a number should be marked with an ink pencil to correspond with the number of the sample. The procedure now is the same as with milk.

In reading the cream test, the fat is measured from *a* to *c*, not to *d* or *b* (Fig. 9). The cream flasks are graduated for 18 grammes and as 9 grammes have been taken, the reading has to be doubled.

To calculate the result.—The weight of cream is multiplied by the test and divided by 100. This gives the amount of butter fat that the factory should pay for.

Example.—A can of cream contains 95 lbs. net. The test reads 22. Then 22 × 2 = 44, gives the correct percentage of fat in the cream.

95 × 44 ÷ 100 = 41.8 lbs. butter fat in that can of cream.

Skim Milk.

It is quite as important to test the separator milk as to test the cows. Frequently, very heavy loss is experienced through the separator getting

out of order or through not being properly worked. A check should therefore be kept by regularly testing the skim milk.

Special double necked flasks (Fig. 7) are used for testing skim milk. They have a wide tube, reaching nearly to the bottom of the flask, through which the milk and the acid are run in. As the graduated neck is of small bore, it is possible to estimate the loss of fat clearly.

Take 17.6 c.c. of skim milk into the flask, as in new milk, and 17.5 c.c. or a little more acid may be used—up to 20 c.c. It is better to add half the acid and mix it, then the remainder of the acid and shake until all the casein is dissolved. The mixing must be done carefully, so that none of the liquid is forced into the graduated neck or some will be lost. The flask must be placed in the machine with the graduated neck towards the outside, so that, while the machine is running, the graduated neck will be uppermost; otherwise, some of the fat may lodge behind the tube and not rise into the neck. The procedure then is the same as with new milk. The loss of fat, as indicated by this test, should be kept below .1 per cent. or one-tenth of one per cent.

It is best to use rain water for testing where possible. If spring water containing lime, &c., is used, it may cause froth to appear on top of the fat column. This should be avoided.

"QUALITY," AS APPLIED TO SHEEP AND WOOL.

H. W. Ham, Sheep Expert.

"Quality" is essentially a wool term, and applies to fineness, or breadth of fibre. Fleeces from merino sheep are known as broad, medium, and superfine. The first, sheep-breeders know as strong wool; the second everybody favours; the last possesses quality in its highest sense, but is usually too delicate to stand heat, dust, and dry autumns, and therefore is not always profitable.

A merino ram, said to be a sheep of "great quality," need not necessarily possess a fleece of similar class. He may have a fleece of even fairly broad quality, or robust staple, and yet be possessed of quality as a sheep.

Quality, in the case of a sheep, is another word for "good breeding," but with stud sheep the term means more; for instance, a "frosty" or "kempy" faced, badly horned, merino ram may have a fleece of good quality, but he would not, as a ram, be said to possess quality. On the other hand, no matter how true a ram may be in face, horn, and trueness of wool in parts, he cannot be said to possess quality in any sense if he has a strong fleece showing wild coarse wool on folds and breech. A Lincoln ram may possess great quality as a sheep, but the best Lincoln wool would be coarse quality. In an export lamb, "sappiness" is quality.

"Style" in a fleece refers principally to perfect crimp and lustre, whereas "style" in a stud sheep is outward appearance. A Shropshire should possess quality of flesh, and show quality all over, but the best Shropshire fleeces, even when possessing length and lustre—as many of them do—could not be called "fine quality."

If a merino ram is said to possess a fleece of beautiful quality, then he is taken at once to be a fine-wool ram. When a ram is stated to have a ewe's fleece, it is meant that he has one of fine quality.

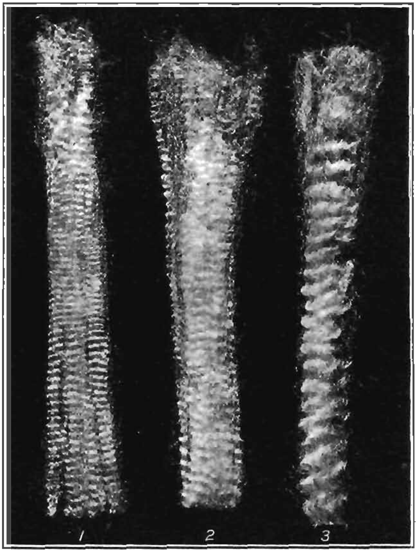
MERINO RAM SHOWING QUALITY IN FACE.

There is more use for rams with well-bred, broad-stapled fleeces, than for rams with very fine fleeces; but, in stud breeding, fine-woolled rams

MERINO EWES SHOWING QUALITY IN FACE.

are occasionally necessary. A merino ram declares his claim to quality by showing all the signs of good breeding, such as soft colour of face and legs; style of horn, &c.; fair amount of lustre in the wool, whether

transparent or buff yolk; well crimped staple (if having had good treatment) or signs of crimp (if worked heavily). As long as these, and other minor details, are in evidence, he possesses "quality."



STAPLES OF MERINO WOOL.

1. Fine. 2. Medium. 3. Strong.

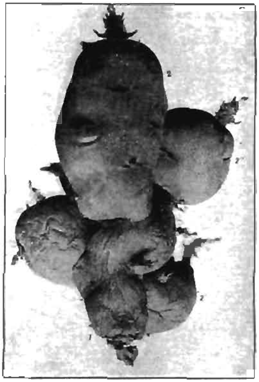
Merino sheep should not be bred to produce wool approaching first cross, or "56's quality." Unfortunately, many breeders produce a wool from merino sheep which is lower in quality than allowable for strong merino. It is called "strong merino," but a more correct term would be "coarse merino."

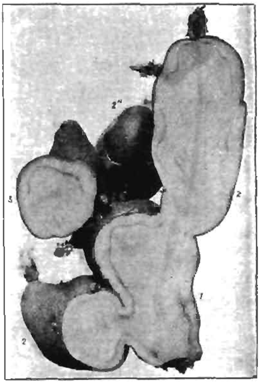
ABNORMAL GROWTHS OF THE POTATO.

D. McAlpine, Vegetable Pathologist.

In the comparatively dry summer of 1909-10, at the Burnley Horticultural Gardens, some of the potatoes grown were rather small; others produced an over-growth of secondary tubers, as in Figs. 1 and 3, and the so-called "wet-ends" were not infrequent. All these gradations from the non-formation of tubers to their excessive development may be explained by the varying nature of the growth.

The normal growth of the potato consists in one or more of the "eyes" or buds growing out at the expense of the nourishment stored up in the tuber. By the time this is exhausted, leaves and roots are usually formed, and an independent supply of food is obtained whereby





1. 2.

1. SUPERTUBERATION—PRIMARY, SECONDARY, AND TERTIARY TUBERS.
2. SUPERTUBERATION—SECTION.

new tubers are produced. If, however, the weather conditions are favourable in the early stages of the plant's growth, so that there is a profuse development above ground, and a dry spell supervenes at the time the tubers should be forming, then the stoppage in the flow of sap may prevent their formation altogether. Hence it is that either no tubers, or only small ones, may be produced by a plant which has luxuriant foliage.

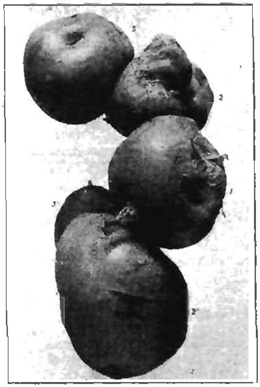
But the tubers formed in the usual way, and, while still attached to the parent stem, may continue their growth in various ways, and this may give rise to the different appearances known as "second growth" or sprouting, super-tuberation, and wet ends (Fig. 1, at bottom). The drier the summer, the more quickly the tubers ripen, and this causes enlargement and multiplication of the cells. The cell walls, with the exception of the very youngest at the eyes, lose their capacity for stretching.

If now, after a spell of dry weather and hastened maturity, a fresh supply of sap reaches the tubers, or the soil becomes excessively heated, the eyes may begin to grow.

First, the fresh growth may cause the eyes to shoot, generally at the crown end, and this second growth, as it is erroneously called, materially reduces the value of the crop.

Second, if the tubers have ceased growing and the rain comes coupled with heat, then the potato plant sends a fresh supply of sap into the tubers, causing the eyes to enlarge and swell, so that strings of tubers may be formed as in Figs. 1 and 3. In this way, the original tuber may become shrivelled up and its progeny surpass it in size.

Third, not only may the eyes shoot, or secondary tubers be formed, but the so-called wet ends or snotty ends may be produced. The stem-end of the tuber is stimulated to renewed growth by the sudden and fresh access of water. It becomes gorged, in fact, and enlarges rapidly, so



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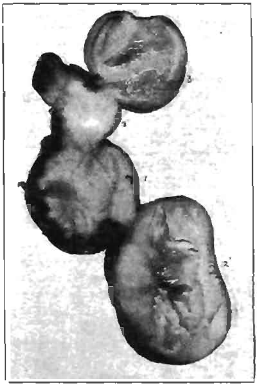


4.

3. PRIMARY, SECONDARY, AND TERTIARY TUBERS.
4. SECTION SHOWING BLIGHT IN 1, 2, AND 3.

that a sort of conical end is formed. Being so soft and succulent it is readily bruised, and a kind of soft rot is often set up. The Vermonts are particularly liable on account of their elongated shape.

In the normal growth of the potato, single tubers are formed at the ends or sides of underground branches, but when there is an excess of heat in the soil, the eyes may sprout, irrespective of moisture; and, if a fresh growth is set up in the plant, by the necessary heat and moisture being supplied after a dry spell, then the eyes or other portions of the plant may enlarge and form tubers direct, giving rise to secondary and tertiary growths.

An interesting case is shown in Figs. 3 and 4 where the primary tuber has given rise to secondary and tertiary tubers on either side. The spawn or mycelium of the Irish Blight was in the original tuber, and it

spread on one side to the secondaries and tertiaries, while on the other side it had not yet crossed over (Fig. 4). The mycelium of the fungus can grow, under favourable conditions, with the growth of the tuber, whether it be a secondary or tertiary growth, or a young shoot, and it can just as easily pass along the underground branches and infect the young tubers that are forming.

EXCEPTIONAL GROWTH OF POTATO PLANTS.

D. McAlpine, Vegetable Pathologist.

The phenomenal growth during the present season was seen in potatoes as well as in other plants, and the length reached by the tops or haulms has never been surpassed in my experience. I had occasion to visit numerous potato-growing districts and closely inspect the crops, and there were plenty of plants which showed excessively vigorous growth along with a large yield. But, taking the height alone into account, the tallest was found in the Bungaree district, where I measured one 6½ feet high, with a fair supply of tubers at the bottom, although some of them were diseased. This was the maximum height obtained until one was brought under my notice from the Daylesford district, measuring 11 feet in length. Quite a number reached 10 feet, and altogether the growth was quite exceptional.

While those stalks over 6 feet in height were grown in the ordinary soil of the district, the latter were obtained from specially prepared soil in a plot only 20 feet square. It will be seen from the description given by the grower, that the soil was more of the nature of a hot-bed or compost heap than ordinary potato soil—

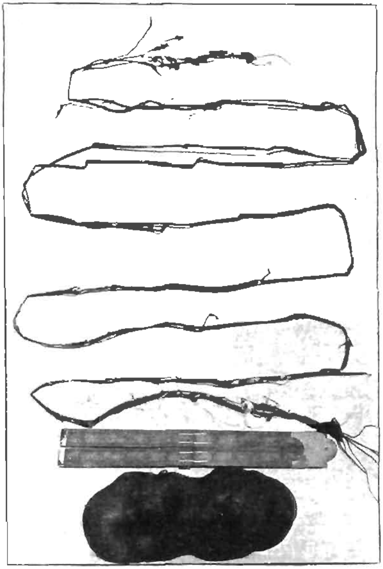
> First of all, I had a small dam for a fish pond and when this went dry I filled it up with old grass and vegetable matter which I gathered from the garden. When this rotted or decayed, I gathered some more and so on until the hole was nearly full. Then I cleaned out an old water race that runs through the garden and got all the sediment from the bottom. A few times after this I put a few barrow loads of fresh stable manure, then some more soil and mixing all this together my bed was prepared.

This made-up soil was about 4 feet in depth when the potatoes were planted.

The variety grown was White Elephant, which is a coloured kidney, with excessively large tubers, and a heavy cropper. The seed was necessarily cut and, on an average, twelve sets were obtained from each tuber. One bucketful of seed was used for the plot, planted in October, 1910, and the digging took place in May, 1911. When the tops dried off for digging, they were so luxuriant that they formed a layer about 9 or 10 inches thick all over the bed. The yield was six standard bags of healthy tubers, and on an average each plant produced from 9 to 10 marketable potatoes.

The photograph shows the stalk measuring 11 feet, and it produced seven potatoes altogether, two of them like the one shown, and five others not quite so large. This potato measured 9½ inches in length, 4 inches across, and weighed 31½ ozs.

The grower was naturally proud of his achievement, and considered that the results did not bear out some of the prevalent theories. As he said, "This tends to knock the old theory of too much tops and no bottoms into pieces." But it may be remarked that the season and the soil were exceptional, and with such reserves of readily available plant food in the ground of a plot only 20 feet square, one is hardly justified in drawing conclusions and applying them to normal conditions.



POTATO STALK 11 FEET LONG, WITH ONE OF THE TUBERS.

The seed was brought out from England some few years ago, and it is rather suggestive that a disease was found on the tops which has been recorded for the first time in Australia this season. It is the Black Dot disease due to *Vermicularia varians;* and, since a stage of this disease occurs on the tubers in the form of little black dots, it is highly probable that it was imported with the seed potatoes.

It is also worthy of note that the plant which grew to such an extraordinary length was affected with Irish Blight, both in the tops and tubers. It must have been attacked, however, in a late stage of its growth, since the tubers had fully matured, and the disease may have been in the seed potatoes when brought out from England, as well as the Black Dot disease already mentioned.

ASPARAGUS.

E. E. Pescott, Principal, School of Horticulture, Burnley.

The edible stems of the asparagus plant form one of the most acceptable, delicious, and healthful of vegetables. *Asparagus officinalis*, as it is botanically known, is a native of temperate Europe and Asia. The old name "Sparagrass" or "Sparrowgrass" is a corruption of the technical name; and the foliage stems of the plant, with their handsome scarlet berries, were commonly known by this name.

All species of asparagus are perennial, with more or less fleshy, tuberous roots. The plant belongs to the Lily family, of which there are culinary as well as ornamental species. In its native habitat, the asparagus plant grows in the sands of the sea-shores; and, while in that location it does not produce large stems, it is thoroughly strong and hardy. Asparagus is easy to grow; and, once the bed is established, it perhaps gives less trouble, and requires less attention than many other vegetables more commonly grown.

Probably the main reason why asparagus is not more generally grown, other than its supposed difficult cultivation, is that, being a perennial plant, and producing results only for about three months of each year, it occupies far more space than can usually be spared in an ordinary vegetable garden. Whilst at least two, and often three or four, ordinary vegetable crops may be grown each year, asparagus occupies the land for the whole year, and is therefore bound to remain a more costly vegetable than most varieties. On the other hand, once the asparagus bed is thoroughly established, the work each year is comparatively light, and asparagus can be produced with far more ease than many other vegetables.

Asparagus requires a deep rich loamy soil, heavily stored with strong organic manures, well trenched and drained, and thoroughly cultivated in autumn and spring. These essentials, combined with a special care in preparing the asparagus bed, are all that will be necessary to insure the establishment of a plot, which will produce good crops for many years.

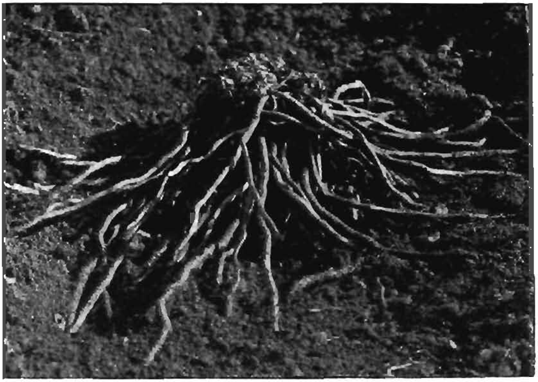
PREPARATION OF SOIL.

The choice of a soil for asparagus culture cannot be given too much attention. It is advisable to have the soil as rich as possible; the soil can hardly be too rich, especially in organic humic material. If a rich, deep soil can be utilized, the operations are greatly reduced. Heavy clay soils should be avoided. It may happen, of course, that the scope of the intending grower is limited, and that he already has his land, which he must employ to the best of his ability. If the soil be at all heavy, then it should all be removed from the area selected to grow asparagus, the vacancy being supplied by alternate layers of good light soil and well-rotted manures.

An old method of preparing an asparagus garden is to dig a pit at least 3 feet deep, the full size of the intended bed. All clay, heavy soil, stones, and solid matter are then removed, and the bed filled with rich friable and drainable plant food. The bottom of the pit is covered with a layer of 6 or 8 inches of well-rotted manure and leaf-mould; above that is placed a layer of rich soil or turf, then a layer of manure, and so on, until the pit is filled. The area is then divided into small plots. Such a bed would produce good crops for years; and no asparagus bed should be laid down without proceeding on the main lines indicated. Perhaps 3 feet

would be too deep, but the depth of opening up should not be less than 2 feet; and, in addition, the bottom should be well dug up or trenched. In order to prevent a lodgment for water, the bed should have drainage exits, particularly where the subsoil is heavy or clayey. In preparing large areas, it would be impossible to follow this system. The soil should be ploughed deeply, without bringing the subsoil to the surface, and it should also be subsoiled, particularly if the latter be not at all porous. A good covering of stable manure should be then given to the field; and the grower will have to rely upon subsequent top dressings with artificial fertilizers to provide nutriment for the plants.

It is beyond doubt that asparagus will thrive better in a friable than in a heavy soil; as, being a native of the sea sands, it requires a loose, free root area. In preparing the beds, anything that will be a plant food, or



A THREE-YEAR-OLD ASPARAGUS CROWN READY FOR PLANTING.

that will tend to open the soil, may be utilized, such as sand, turf, wood ashes, soot, crushed bones, leaves, grass cuttings from lawns, straw, seaweed, in addition to the ordinary fowl, cow, pig, and horse manures. Whatever food ingredients are added to the bed should be well blended together; large heaps of any one substance should be avoided in the beds. It is a decided advantage to have the bed prepared in the autumn, so that the various ingredients may be sweetened and mellowed before the planting season.

PLANTING.

The plants may be set in the rows from June to August. The beds should be arranged so as to take every advantage of the sun—a warm aspect is needed to induce quick growth in the springtime.

One-year or two-year-old plants may be used. If the yearling plants are strong, with well developed crowns, and three or four buds, they may be planted; they will give as good results as two-year-olds. Seedling crowns are to be preferred to divisions of the older crowns, as the young

plants have greater vigour and vitality. The plants should be planted in rows, 3 feet apart, with about 18 inches between each plant. In large areas, the plan of planting in double rows is often adopted, the rows being alternately 2 feet and 3 feet apart. This allows for a furrow or a trench to be run between each double row in the winter, to provide for good surface drainage. The trench is dug deeply, and at a lower level than the crowns, so that there shall be no possibility of surface water settling about the roots in the cold weather. The plants should be placed at least 6 inches below the surface. For planting, a furrow or trench may be run along the length of the bed, and the crowns placed in this. The roots should be directed downwards, so that it will be well to have a slight crown in the centre of the furrow; they may then be covered with soil, and well trodden, care being taken to tread at the sides, and not on the crowns. A top dressing of manure will complete the work of planting. Sometimes, where the soil is not particularly rich, it will be advisable to give a light sprinkling of bonedust or sulphate of potash in the trenches before planting.

If it be desired to grow seedlings, the seed should be planted in a well drained bed of rich soil, in rows about 2 feet apart. The seed should be sown very sparsely, subsequently thinning the plants out to 8 or 9 inches apart. Thorough cultivation should be observed throughout the year; no weeds should be allowed in the seed bed. Frequent waterings with liquid manure, especially in dry weather, will make the results successful.

"Conover's Colossal" is the largest asparagus grown; while "Palmetto" is also a good variety, rather earlier than the former; Argenteuil Purple is another good variety, and very tender.

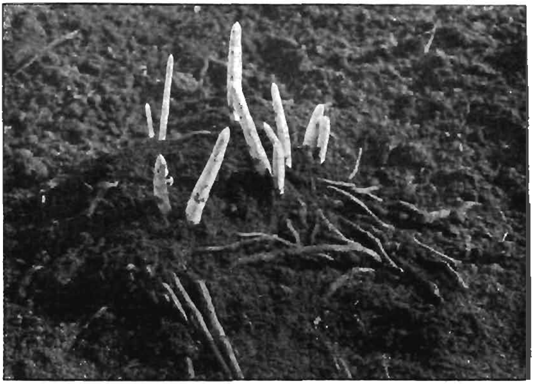
CULTIVATION AND MANAGEMENT.

From springtime to autumn, the beds will require to be continually hoed and cultivated. No weeds should be allowed in the beds; and if these are frequently hoed, no trouble will be experienced from foreign growths. Soil crusts and sodden surfaces must be avoided; and in autumn, and again in spring, the beds may be forked or dug over. If trenches are cut between the rows, the soil may be thrown up on top of the crowns.

During the first year, the plants should be allowed to grow without any cuttings being made. If good sturdy growth has been made, the beds may be sparingly cut over during the second year, and then only for four or five weeks. Cutting causes weakness of growth; and, until the plants are sturdily established, they should not be weakened by forcing them to make unnatural growths. Subsequently, the beds may be regularly cut over, terminating the third year's cutting time with the end of November, and all subsequent cuttings early in December; with later varieties and in cooler districts the season will be extended. In matured beds, the cuttings should always be "clean." That is, every growth, whether sturdy enough for culinary purposes or not, should be cut out. The stalks that are too small or poor for eating may be thrown away. From December, all growths should be allowed to continue until autumn, when the beds may be cleaned out, completely cutting down all the old growths level with the ground, and top dressing with stable manure. The tops are cut as soon as the seeds are ripened These then appear of a bright scarlet colour. The seeds must not drop to the ground, as they will germinate and grow, and the seedlings will become some of the worst weeds in the beds.

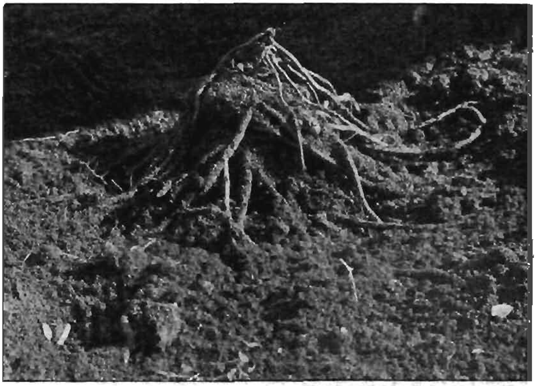
MANURING

Even though the plantation has been well manured before planting was carried out, the plants require constant feeding, as asparagus is an



ASPARAGUS STEMS READY FOR CUTTING.

exceptionally gross feeder. Dressings of stable manure may be given after cleaning out the beds, and after the beds have been "cut out" and are



SEEDLING ASPARAGUS GROWING ON TOP OF CROWN.

allowed to grow in December. Seaweed is a valuable mulch for asparagus; and, if available, should be applied. In addition to these, occasional sprinklings of chemical fertilizers may be given in spring and summer. As frequent cuttings for some time, of every growth produced by the plant, is a heavy tax on its vigour and abilities, it should be well nourished with readily available food, so that it may continue to produce good growths; thus, frequent feedings during the growth period will always be helpful. The plants cannot continue to bear good payable crops, and at the same time be compelled to continue in growth and existence without special help and assistance.

The most perfect chemical fertilizer for asparagus is a mixture of 2½ cwt. of sulphate of ammonia, 2 cwt. sulphate of potash, and from 4 to 5 cwt. of bonedust per acre. Blood manure, nitrate of soda, kainit, and muriate of potash are all useful for top dressing. Owing to asparagus growing on the seashore in its native habitat, it was supposed that the plants required frequent dressings of salt to enable it to grow successfully. It has been found, however, that such is not the case. Further, on analysis, it has been shown that of all ingredients in the composition of this plant, salt is in the lowest percentage. Salt will kill the weeds without injuring the asparagus; and has an indirect effect in reducing, to an available condition, certain plant foods that already exist in the soil. If the grower wishes at any time to use salt on his beds, it will be better to apply kainit, which contains salt in combination with potash.

Cutting.

With the advent of the warm spring weather, the asparagus stems begin to come through the surface, and they are ready for cutting. They should be cut before the scales on the heads have opened out, the knife being inserted into the ground, cutting the stems below the surface, and carefully avoiding any other stems that are growing out from the same crown.

There are various asparagus knives in use, but all are made on a similar principle, having the cutting edge at the end, instead of at the side, the end being either at right angles to the side, angular, or curved. A recently invented asparagus knife has its cutting end shaped like a V, both inside edges being sharpened.

Pests and Diseases.

In this State, the asparagus plant is singularly free from these troubles. In America, considerable injury is done by the Asparagus Beetle, which is a pretty, red, lemon, and dark-blue coloured beetle. The beetle causes damage by the larvæ burrowing into and eating the young asparagus stems.

Asparagus rust frequently causes considerable damage by attacking the growing stems, and thus weakening the whole plant and interfering with its growth. It is always a safe plan to burn the tops of the plants when they are cut down in autumn; this will destroy effectually both fungus spores and insects that may be lurking therein. In California, great havoc and considerable loss resulted from continued attacks of the asparagus rust. There, both sulphur and Bordeaux mixture have been used with good effects. It has been also found that some varieties are more resistant to rust than others. The "Palmetto" variety stands out prominently as being an excellent rust resistant; while the French variety "Argenteuil" is considered equally rust proof.

CONCLUSION.

If the field or beds have been well established and well cared for, there is every reason to expect that they shall be productive for many years. A field planted in 1852 is still in existence in California.

Asparagus canning is a very important industry in America; and it is now established on a sound commercial basis. "Conover's Colossal" is practically the only variety grown there for that purpose.

THE ROOT BORER AND ITS PARASITE.

H. W. Davey, F.E.S., Inspector, Vegetation Diseases Acts.

The Apple Root Borer (*Leptops Hopei*) is, in many districts of the State, one of the most formidable enemies of the fruit industry, and has exercised the minds of experts and growers alike in trying to determine an effective remedy against its ravages.

The beetles, on emerging from the soil, generally ascend the tree on whose roots they have been feeding during their larval existence. The female, after mating, seeks the leaves on which to deposit her eggs, which vary greatly in number, often reaching as many as 150. The incubation period of the eggs is about three weeks, and the major brood occurs during the spring, but the writer has seen fertile eggs as late as 25th March, and is of opinion that a not inconsiderable number is produced right throughout the year. Not only are the eggs deposited on the leaves of fruit trees, but they have been found on weeds, crops, hedges, &c., so that the beetle has a wide range for the deposit of her eggs.

The newly-hatched grub immediately descends and burrows into the ground until it reaches its normal haunts among the roots. In spite of trapping the beetles and spraying the food plant of this borer with arsenical poisons, the menace of this particular pest is in no way abated.

Soils of a heavy stiff nature are eminently suitable to the root borer, owing to the peculiar way in which the larva feeds. It does not bore into the roots of the trees, but rather flutes or grooves them, so that three sides of the tunnel in which the larva has free movement is formed by the root, and the remaining side by the stiff, compact clay. On the other hand, loose sandy soils are unsuitable owing to the grit continually falling in from the tunnel walls to the injury of the insect. After becoming full grown, the larva usually retreats to the highest part of its tunnel, where it pupates. In its native haunts, this insect is probably kept somewhat in check by the difficulty the newly-emerged and scarcely hardened beetle would have in forcing its way for some considerable distance through soil caked hard and unbroken in any way, whereas, in the orchard, through the ameliorating influence of cultivation, its path from the depths below is made easy. When we remember also, that, with all insects, the change from the pupa to the imago state is always attended with great risks, it seems to the writer that the cultivated soil is a great and unavoidable factor in the increase of the beetle.

As the borer only works in stiff soils, it is useless to attempt to suppress the pest by means of the injection of poisonous fumes into the soil, as the clayey nature of the soil would prevent the fumes from permeating to any considerable extent. Experiments carried out, by direction of the Chief

Inspector, by the other inspectors and myself show this to be the case. In his report, Inspector Hammond states:—

Owing to an improvement in the growth of the trees some time after the injection of carbon fumes, it was erroneously attributed to the destruction of the borers at the roots, but Massey points out that, *though the carbon fumes destroy the nitrifying* bacteria of the soil, they also destroy all the forms of bacteria, amongst which are those that prey upon the nitrifying ones, and these latter, when again introduced, multiply much more rapidly than the others, and stimulate the growth for a short period.

On 24th March I treated four Five Crown apple trees in the same orchard. I made holes with a crowbar, as the injector would not put the carbon down sufficiently deep. I had ascertained that, in soil such as the one being treated, no grubs live within about 20 inches of the surface. I gave from 18 to 21 injections to each tree, using the Pal injector; $\frac{1}{4}$ to $\frac{1}{2}$ oz. of bi-sulphide being injected into each hole. The holes were about 30 inches apart, and 20 inches from trunk of tree, and were within a circle of about 9 feet in diameter. The quantity of bi-sulphide used for each tree was from 6 to $10\frac{1}{2}$ ozs.

On 25th May, about eight weeks later, I partly grubbed one of the trees treated on 24th March. A careful examination of the soil and roots was made, and five live grubs and one dead one were found. Three of the live grubs were nearly full grown, one about half grown, and one very small. The dead grub was full grown, and in a *good state of preservation. None of the grubs were found nearer* than 24 inches to the surface. The dead grub was found 30 inches below the surface.

I partly grubbed two other trees, not treated, for the purpose of comparing them with the one treated. I found four grubs and a beetle from 24 to 30 inches below the surface in the clay in one tree, and one grub and one beetle were found in the other. No dead grubs were found in the untreated trees, but, apart from this, there was no difference in the appearance of the grubs. In this case the bi-sulphide did little or no good as far as I could see.

Inspector Cock, of Bendigo, has carried out experiments in root treatment, by the application of bi-sulphide of carbon; and, in addition, gas lime, lime, cyanide of potassium, and cyanide of soda, with no appreciable benefit.

ARSENICAL SPRAYING.

There is evidence that arsenical spraying is partially effective. Inspectors Farrell and Hammond reported that they have found as many as thirty dead beetles under trees sprayed with arsenate of lead, whereas prior to the use of this material no dead beetles were to be found. Though spraying may kill many of the beetles, it cannot, in my opinion, be regarded as other than a factor, and probably a small one, in dealing with this insect. Even if the beetles consume sufficient of the sprayed foliage to get a fatal dose, death in insects is always slow from arsenical poisons.

The first thing that takes place on emergence from the soil is the copulation of the sexes, so, even if the female were killed by poison, she would be fertile, and probably able to eject her eggs (as many insects do when dying from injuries, &c.), though too feeble to draw the leaf together to protect them. On the other hand, eggs are not fully developed when beetles first emerge from the soil, and the beetles might be poisoned some time before this happens; but, notwithstanding that these creatures devour large quantities of foliage, the vitality of all insects immediately previous to egg-laying is remarkable.

In order to be successful it would be necessary to spray the fruit trees during their period of growth, as well as all herbage throughout the entire year

BANDAGING.

Bandages are of little use unless properly attended to and adjusted, as the beetles are capable of walking up clean glass almost as freely as up a

tree trunk; and many pass these collars for the purpose of egg-laying, so that the orchardist is depending on something that only stops a percentage of the beetles.

At Panmure, every tree is "collared" and attended to every morning right through the season, except in the case of gooseberry bushes. As the larvæ feed on the roots it makes little difference to them where the eggs are laid, and possibly a gooseberry bush is just as acceptable as an apple tree. It will therefore be seen that the gooseberry bushes require as much protection as the trees.

Messrs. Moore Brothers, of Vauxhall Gardens, Panmure, have for many years kept a daily account of the number of beetles killed on a 7-acre patch of their orchard of 60 acres, the only part attacked. During 1905, 14,633 beetles were trapped and destroyed. This number diminished until, in 1907, it fell to 7,190; in 1909, it increased to 15,360. Not only were these growers extremely careful in trapping the beetles, but greater attention has been given to spraying during the latter years. Still, instead of an appreciable diminution there was an actual increase of over 100 per cent. in the beetles trapped.

A PARASITICAL ENEMY.

From my own experience, and that of growers like those referred to, it would appear that there must be some natural check to the multiplication of this insect in the native timber, otherwise our forests would be entirely depleted. The difficulty the beetle may have in emerging from the soil in the uncultivated lands would probably to some extent affect its increase, but not sufficiently to account for the comparatively little damage that it does to our forest trees. I was therefore led to the conclusion that other factors were at work towards this end, and began investigations in this direction, with the result that a parasite very deadly to the borer was discovered.

PERILITUS LEPTOPSI, VIERECK, *n.sp.*

On dissecting a female Leptops in June, 1910, she proved to be full of parasites, so live beetles were placed in observation cages. In the course of a few days parasitic larvæ emerged from these, and pupated in tiny silken cocoons all clustered together, showing at once that they belonged to the *Hymenoptera* (probably the *Braconidæ*). From these cocoons the perfect insect emerged in October, the time of year when the root borers first appear, but unfortunately before being able to obtain more beetles the parasites died. The parasite was again observed in large numbers during December at Panmure, and January at Mount Cole, near Ararat—the only places where this insect has been so far discovered.

The female parasite is furnished with a long ovipositor, with which she injects her eggs into the abdomen of the beetle. On these hatching, the minute grubs first feed on the eggs of the beetle contained in her body. Sometimes it happens that these eggs supply sufficient food during the larval existence of the parasites, which can be seen emerging from their erstwhile habitat for the purpose of pupating. Strange to say, the beetle in some cases, after the exodus of the parasite, appears healthy and active for a short time. As a rule, however, the parasites, after consuming the beetle's eggs, turn their attention to their host, and eat up absolutely everything contained in her abdomen, the beetle dying as they emerge.

During January, as far as could be discovered, only female beetles were parasitized, but later on, as this enemy of the root borer increased in numbers, the male beetle attracted their attention, and was completely eaten out by these ravenous creatures, leaving the abdomen a mere shell.

The number of parasitic larvæ contained in a beetle varies, but last season averaged 25, so that the orchardist who kills a parasitized beetle is at the same time destroying, on an average, 25 parasites. In order to give this friend of the orchardist an opportunity of determining its value, it would be advisable, instead of killing the root borer beetles, to place them in boxes having perforated zinc ends, to allow the parasites free ingress to and egress from the box. This at the same time prevents damage being done by unparasitized beetles.

The imago form of this parasite has been reared in October and also in March. Those appearing in March left the beetle as larvæ on the 25th February, and had all pupated by the next day, the perfect insect appearing on the 11th March, a matter of only thirteen days.

Numerous specimens were submitted to Mr. C. French, Government Entomologist, for his opinion; and as Mr. Arthur M. Lea, Government Entomologist of Tasmania, is regarded as a specialist on the *Curculionidæ*, specimens of the parasitized beetles were forwarded to him. In reply, a letter was received from Mr. Lea saying :—

The parasites of Leptops are certainly *Hymenopterous*, as from the specimens you sent over I have now about 100 cocoons.

Mr. Lea then suggested that, as in all probability this parasite was new to science, specimens should be forwarded to Dr. Howard, Chief of the Entomological Bureau at Washington, U.S.A., for naming and description. This was done by Mr. Lea. In further correspondence he writes :—

I think it is almost certain that the parasite is a new species, and it is certainly one of the most important that we have in Australia. It was for this reason I suggested its being sent to Dr. Howard.

The discovery of this parasite may prove of the greatest value to fruitgrowers generally. It behoves all interested in the eradication of the Root Borer to study this phase of treatment, and endeavour to assist the parasite in multiplying and increase the opportunities it may have to carry out its usefulness.

The following correspondence, together with the description of the insect from Dr. Howard, is of interest, not only to the growers of this State, but to those who follow up this line of study and investigation. The writer is indebted to Mr. Lea for the outline drawing of the parasite, which is here reproduced.

Dr. Howard writes :—

I am now able to give you the determination of the parasite of Leptops. Mr. H. L. Viereck, of this Bureau, has been studying it, and has described it as *Perilitus leptopsi, n.sp.* I enclose manuscript description, which you are at liberty to publish in connexion with illustrations and any matter you may care to add to it.

Perilitus leptopsi, Viereck, n.sp

Female.—Length, 2.5mm. Compared with *P. secalis*, Haliday, as described by Marshall, this differs as follows :—Mid and hind legs beyond coxæ more or less blackish, prothorax and mesothorax mostly castaneous; abdomen beyond the petiole mostly black or blackish, basally somewhat castaneous in the middle; wings tinged with brown, veins and stigma brownish, tegulæ rather testaceous; first tergal segment nearly as long as the remaining portion of the tergum, mostly smooth and polished, postpetiole nearly as long as the petiole proper, and almost parallel sided, owing to the prominently produced spiracles, petiole proper on each side near the middle with a shallow-fossa, appearing to be due to the aciculation of the tegument at the same point, sheaths of the ovipositor blackish throughout.

Male.—Length, 2.25mm. Resembles the female, but with the thorax and abdomen almost entirely black, and with the postpetiole rather sculptured throughout.

Type.—Locality, Panmure, near Warrnambool, Australia. Type Cat., No. 13642, U.S.N.M. This species was also collected or reared as parasite of a species of Leptops at Mount Cole, Ararat, Australia, by H. W. Davey.

The larva has somewhat the appearance of Figure 12 in Ratzebury's second volume of Ichneumonen der Forstinsecten. A series of some fifty-five imagoes shows less variation than is credited to *P. secalis*, Haliday.

For the benefit of those who may not have access to Marshall's Monograph of British *Braconidæ*, it may be stated that this species belongs to the category with the first submarginal cell confluent with the first discoidal, radial cell with its tip a little nearer the stigma than the tip of the wing, and with three-jointed labial palpi.

INSECTS DESTRUCTIVE TO CROPS.

CUT WORMS.

C. French, jun., Assistant Government Entomologist.

During the past season numerous inquiries for information in regard to the above mentioned insects and the best means for destroying the same have been received. The Climbing Cut Worm (*Mamesta ewingi*) has been very prevalent, grain crops, barley in particular, being badly attacked. Other Cut Worms—*Agrotis* (several species), *Heliothis. armigera, Leucania*, and others—have also been much in evidence. Cut Worms are amongst the most troublesome insects growers have to deal with, and every year they are the cause of much destruction on farms, vineyards, and gardens. Wheat, oats, barley, maize, vines, plums, tomatoes, onions, beans, cabbages, and potatoes are all subject to attack.

Cut Worms are also known as Cut Worm Caterpillars, Looper Caterpillars, Army Worms, Take-all Grubs, &c. They are variable in colour, especially the larvæ of the Tomato Moth. The latter vary from green to yellowish, but most of the *Agrotis* are of a dirty greyish or light-brown colour, without hairs or spines, smooth, and greasy looking, often being of a similar colour to the ground in which they hibernate. Some of the cut worms feed both day and night, whilst others hibernate just under the soil, or under logs, stones, bags, bark, and rubbish during the day and feed during the night. When they are fully grown (which takes a couple of weeks), and until they are ready to pupate, the pupa is of a dirty reddish-brown colour, sometimes almost black. After pupating, they remain in the ground, in the warm weather, from ten to fifteen days before the moths emerge; in the cold weather, the period is much longer.

LIFE HISTORY.

There are at least two broods of cut worm moths in a season, but further observations will be necessary before the number is finally ascertained. The moths usually fly about at dusk and deposit their eggs on any suitable plant. The eggs hatch in a few days, and the young cut worms start to feed at once, any kind of green food being greedily eaten by them. Even when the grain is just sprouting it is attacked, and often they will eat right into the husk.

The coloured plate shows some of the common cut worm moths, and also two other species of closely allied noctuids (night moths). In the museum of economic entomology and ornithology of this Department are specimens of all the Victorian cut worm moths, their eggs, and larvæ. The collection may be inspected by all interested.

EXPLANATION OF PLATE.

Natural Size. From Nature.

I. *Chloridea obsoleta.* (Tomato Moth.)
II. *Cirphis unipuncta.*
III. *Euxoa radians.*
IV. *Persectania ewingi.* (Climbing Cut Worm.)
V. *Plusia argentifera.* (Silvery Moth.)
VI. *Agrotis spina.* (Bugong Moth.)
VII. *Euplexia nigerrima.*
VIII. Larva of *Agrotis.*
IX. Larva curled up.
X. Pupa of *Agrotis.*

REMEDIES.

By the eradication of weeds and the burning of haulms and stems of harvested crops the cut worm evil may be greatly minimised, as by this means many eggs are destroyed.

Growing crops may be treated in the following manner:—Place between rows of an infested crop or at short distances apart, bundles of any succulent weed or vegetable which has been previously poisoned by dipping it, after tying in bundles, into a strong mixture of Paris green 1 oz. to a bucket of water. The cut worms eat the poisoned plants, bury themselves, and die. In hot, dry weather the bundles should be put out after sundown. Correspondents have frequently inquired whether there is any likelihood of vegetables absorbing Paris green from the mash when placed near the roots. I am assured by the Chemist for Agriculture that there is no danger as the Paris green is practically insoluble, and therefore cannot be absorbed by the various plants.

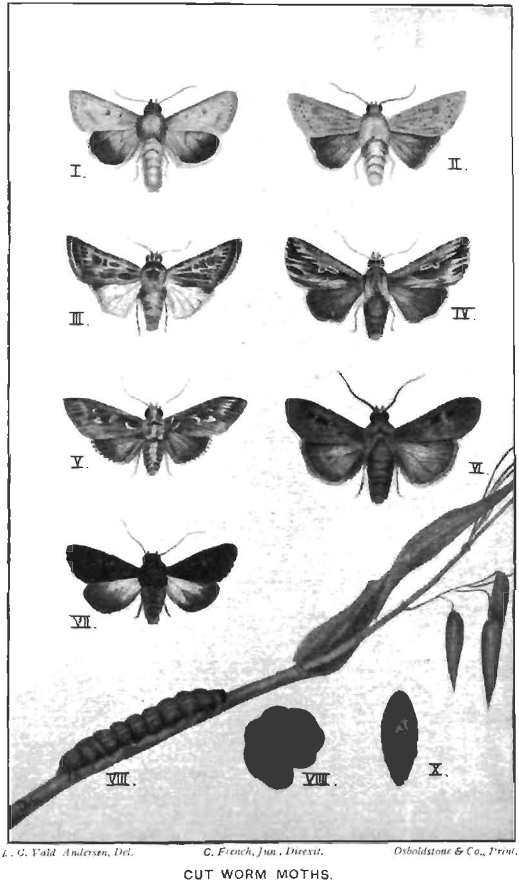
The poisoned bran mash has also been successfully tried. The best proportion to use is one part by weight of arsenic, one of sugar, and six of bran, to which is added sufficient water to make a wet mash. This mixture is usually made in a wash tub or half barrel. One of these is filled three-fourthsful with dry bran, and to this is added about 5 lbs. of arsenic, which is thoroughly stirred through the bran with a spade or shovel; 5 lbs. of sugar are next thrown into a pail, which is then filled with water, and the sugar stirred until it is dissolved, when the sugar water is added to the bran and arsenic, and the three well stirred. More water is added and the stirring continued until every portion of the mash becomes thoroughly saturated. The mixture should be placed around and through the crop, or at the foot of the tree, plant, or shrub infested, dropping it into the shade when this can be done. Both of these preparations should be kept out of the way of children and domestic animals.

With regard to the efficacy of the poisoned bran mash, I have recently received the following letter from Mr. G. Ray, of Lindenow, Gippsland:—

> The cut worms were very prevalent this season, but I have had great success in destroying them. I had a crop of English barley, and, thanks to the use of the bran mash, I have just threshed from 40 to 70 bushels per acre. The caterpillars were two or more inches deep in shady places, and I am sure that I would not have had any returns unless precautions had been taken.

Mr. C. W. Malley, Eastern Province Entomologist in South Africa, reports excellent results with poisoned baits. He says:—

> It occurred to me that by cutting up any available green stuff (lucerne, barley, forage, cabbage, rape, young succulent weeds, &c.) into small bits, say half an inch in length, it could be moistened with the poisoned sweet and then scattered broadcast over the lands with least labour and material. In this way, it is distributed evenly, and at such frequent intervals, that the cut worms are practically certain to find it before they do the plants. Their fondness for sweets induces them to fully engorge themselves on the bait, a fact which makes their destruction certain. There is also no danger to stock, for the pieces of bait are so small that nothing but poultry can pick them up, and it is not likely that even they will get enough to injure them. But, as a precaution, they should be kept from the lands where bait has been spread.



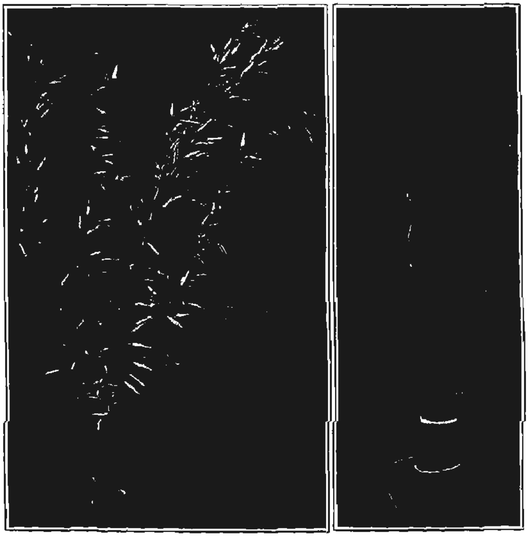
L. C. Vald Andersen, Del. *C. French, Jun., Direxit.* *Osboldstone & Co., Print.*

CUT WORM MOTHS.

During the past six months several additional experimental tests have been made for cut worms, and with satisfactory results. I see no special difficulty in the way of its application on a large scale to lands planted with tobacco, maize, or other crops, and therefore call attention to it for the benefit of any who may have occasion to use it.

METHOD OF PREPARATION.

Arsenite of soda	1 lb.
Treacle, or brown sugar	8 lbs.
Water	10 gals



OATS BEFORE AND AFTER ATTACK BY CUT WORMS.

Dissolve the arsenite of soda and the treacle in the water. In the meantime, cut up the lucerne, or other green stuff, into small bits, and then moisten it with the poisoned sweet. Be careful not to make it too wet or it will not scatter well when broadcasting. For the best results, the bait should be distributed a few days after the ground has been ploughed, and all green, succulent vegetation destroyed. The cut worms that are not crushed in ploughing will then be on the surface again, and on account of their long fast, practically all of them will be prowling around in search of food. In this way, one application will probably be sufficient. If injury is noticed after the young maize plants appear, the application should be repeated.

Arsenate of lead spray has proved one of the best remedies yet discovered. Where cut worms are feeding in grass paddocks adjoining crops, it is advisable to spray a strip of the crop. After devouring the grass, they

move on to the crop, and when they come to the sprayed portion devour it greedily, and are soon destroyed. If vegetables are sprayed it is advisable to thoroughly wash them before using.

The trench system is a simple and effective method of eradication. A trench or furrow should be either ploughed or dug around the crop towards which the cut worms are feeding. It must have clear cut sides; those nearest the crop should be undercut so as to prevent the cut worms from crawling out of the trench. Deep holes should be made in the trench at intervals of, say, five yards. When travelling towards the crop the cut worms fall into and crawl along the trench and ultimately into the holes. A few shovelfuls of earth, well rammed, will then speedily destroy them. Should the pest be already in the crop it will be necessary to run a few furrows through it.

Another plan that answers well is to place a flock of sheep in the infested paddock adjoining the crop. The constant walking about of the sheep will destroy the cut worms.

If cut worms are prevalent in gardens, rake the ground up close to the plants. By this means many of them are turned up; and, if poultry are allowed to run over the ground very few will escape their notice. They are also easily injured by the rake and are then likely to be eaten by ants and insectivorous birds when exposed on the surface of the ground.

Numbers of cut worms are destroyed by hymenopterous and other parasites. Very wet and cold weather also keeps them in check.

PRACTICAL HINTS ON CUT WORM DESTRUCTION.

F. de Castella, Government Viticulturist.

At Mr. French's request I have pleasure in supplementing the article in which he deals with Cut Worms, generally, by a few remarks summarizing the experience of North-Eastern vine-growers who, during the past three seasons, have found one of the most serious obstacles to the successful reconstitution of their vineyards in the ravages of *Agrotis* caterpillars, commonly known as Cut Worms, as well as of several small beetles* which, like them, hide below the surface of the soil during the day and ravage the leaves and shoots of the young vine at night time.

The experience gained by vine-growers may prove of value to other agriculturists, as well as to those about to plant vines for the first time.

In these insects we have no new pest, but one which has long been with us. Vine-planters of 20 years ago knew them well, though, owing to the small amount of vine-planting carried out until quite recently, this fact has been forgotten, and cut worms are often erroneously looked upon as a recent introduction.

The prevalence of the trouble varies greatly. It is common to find, in the same district, one vineyard which suffers severely, whilst another perhaps only a mile away, is quite free. Sandy soils are usually more liable than stiffer ones. In many of the pine-ridge vineyards recently planted near the Murray, damage from cut worms has been severe. Nevertheless, trouble has also been experienced in some vineyards planted on stiffer soil, though, as a rule, to a lesser extent.

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* Specimens sent to Mr. French were identified as *Hopatium Australe* and different species of *Haplonchya* and *Heteronyx*.

PREVENTIVE METHODS.

A predisposing cause of trouble is the presence of an abundant crop of weeds at the time the moths lay their eggs. These appear to instinctively realize the presence of food for their offspring on dirty land, and to avoid laying their eggs on ground free from weeds.

The ground of the young vineyard should be clean and well cultivated from the commencement of winter. Attention to this point alone will greatly reduce the prevalence of the insects. Subsequent cultivation, no matter how thorough, will not give security once the eggs have been laid. In fact, it only aggravates the trouble. As the caterpillars cannot find any plants to feed on but the young vines, their concentrated efforts are all the more severely felt. In the keeping clean of the ground on which young vines are to be planted, or of young resistants which it is intended to field-graft in the following spring, we have a means of prevention, the value of which is not sufficiently realized.

Preventive treatment, by destruction of the moths before they lay their eggs, is also worthy of consideration. Judgment and close observation are necessary in order to hit upon the most propitious time of operation, when the moths are abundant and ready to lay their eggs. Acetylene lamps of special construction are used for this purpose. The burner is situated a few inches above a shallow tray, filled with water, on the surface of which is poured a small quantity of kerosene. The insects, attracted by the strong light, get their wings singed and fall into the tray, where they are found in large numbers in the morning.

Lamps of this description have been successfully used at the Wahgunyah Nursery during the past two seasons. It is not easy to estimate to what extent subsequent invasions were prevented by this means, but there is no doubt that large numbers of moths were destroyed. The lamps available were far from perfect, the automatic regulation of the gas supply being more particularly defective.

In France, trap lamps of this kind are largely used for the destruction of Cochylis and Pyrale moths, the larvæ of which, in the shape of minute green caterpillars, are responsible for an enormous amount of damage in some districts. In parts of Champagne, where such lamps have been used on a large scale, six lamps per acre are considered sufficient. The type of lamp most largely used was one fitted with Bray's patent "Ceto" burner, burning 10 litres (about $\frac{1}{4}$ cubic ft.) per hour, and taking a charge of 7 ozs. of carbide, sufficient to last five or six hours. The tray is 20 inches in diameter and $1\frac{3}{4}$ inches deep.*

Though capable of giving good results in nurseries, trap lamps are not, owing to the large number required, and the difficulty of attending to the lamps at night, so practical in the vineyard.

ARSENICAL POISONING.

This is the method of protection which has given the best results in Victoria. Two distinct systems have been largely used :—

1. Spraying with lead arsenate in suspension in water.
2. The use of baits, in close proximity to the young vines.

Each has its partisans, and each has given excellent results when properly applied. According to circumstances, one or other method may be more suitable for a given case. It will often be found advisable to combine both methods.

* MM. Martin-Flot and Piusard in *Progrès Agricole*, 28th August, 1910.

Lead Arsenate Spray.—The most suitable strength seems to be 3 lbs. of any good brand of arsenate to 50 gallons of water. This strength does not in any way injure the foliage or tender shoots, whilst it is sufficiently strong to destroy the caterpillars, especially when they are young. In fact, in order to obtain the best results from such sprays, they must be used when the larvæ first hatch out from the eggs. It is easy to understand that, under these conditions, a very much smaller dose will prove fatal than later on, when the insects have attained a certain size. It must be remembered that they grow exceedingly rapidly, feeding the while on the unfortunate young vine. A careful watch must be kept, and on the very first appearance of the trouble, evidenced by characteristic small holes eaten out of the tender leaves, the whole of the young vines must be immediately sprayed.

At the Wahgunyah Nursery, last season, spraying completely prevented any damage, but it was applied from the very first appearance, when none of the cut worms were longer than ¼ inch. Three separate invasions had to be fought in this way, resulting from eggs laid by three different generations of moths. The first spraying was given about the second week in October, the second about a fortnight later, whilst a quite distinct generation of minute cut worms necessitated the commencement of a third spraying on 22nd November.

In spite of the very sandy nature of the soil, and the fact that the nursery was surrounded by paddocks where the grass was high, conditions favourable to the pest, these three sprayings absolutely protected the young vines from damage.

Baits.—In order that spraying may be successful, there must be some green foliage to spray; in other words, the young vines must have sent out shoots and small leaves before the cut worms make their appearance, as was the case in the example quoted above.

If, as not unfrequently happens, the cut worms are in the field first, that is, before the vines come into leaf, spraying is useless. This is what frequently happens when the land has, during the winter, been covered with weeds, which have been suppressed by repeated cultivation, just before the vines were planted (or grafted in the case of field grafting). In such circumstances, considerable numbers of quite large cut worms may be about before the buds of the young vines burst.

The deadly effect of these, on the young plantation, can easily be imagined. The young buds may be eaten right out, before they break through the protecting mound of soft soil; other shoots growing from latent buds meet with a similar fate, and the young vine is often killed outright, or, at any rate, so considerably damaged and its start into growth so much retarded as to permanently injure it. As many as 16 or 20 fair-sized larvæ have been found in the soil at the base of a single vine. Field grafts, in spite of the rapid growth they make, are often seriously damaged, if not completely destroyed, in this way.

Against such visitations the only practical means of defence is the use of baits. A formula which has given good results is the following:—Bran 10 lbs., molasses 4 lbs., Paris green 4 ozs. The whole to be made into a paste or dough and placed, in small pieces about the size of a nut, in close proximity to the young vine. These are greedily eaten by the cut worms, which are thus destroyed in large numbers.

The baits are no longer acceptable once they are dry. As the weather is hot in October and November, they dry up very rapidly, and cease to be of use after the first night. Baits should, therefore, only be put

out after sunset. Should all the insects not be destroyed by the first application, it is necessary to repeat the dose. It is well to remove the dried-up baits previously put out, on account of the injurious effect of the arsenic on vegetation if left to be washed into the soil by rain. For this reason, care should be taken not to place the baits in contact with the young vine, but at least an inch or so away from it.

In one plantation where this precaution was not observed, many vines subsequently died from arsenical poisoning. The cause of death was at first obscure. The action of the arsenic contained in baits, which had been extensively used (with very satisfactory results so far as cut worm destruction was concerned), was suspected. Analysis revealed the presence of arsenic in the interior of the stem of the dead vines, so there appears to be little doubt as to arsenical poisoning being the cause of death.

Paris green, which usually contains more or less free arsenious acid, could probably, on this account, be advantageously replaced by arsenate of lead in the bait formula given above. The insolubility of the latter salt would insure safety from a similar mishap. Nevertheless, with due care against absolute contact, there is little or no danger. Although Paris green baits were very extensively used in Rutherglen during the past three seasons, in only one case was poisoning reported.

Vegetable Baits.—It is probable that good results could be obtained by growing, in close proximity to the young vine, plants which the insects eat readily, and which could, by spraying with lead arsenate, be converted into poisonous baits. These would be capable of acting so long as the arsenate remained on them, instead of merely for a single night, as is the case with the artificial baits. Arsenical poisoning of the vine would also be obviated.

Young Soya Bean plants are greedily eaten by cut worms, and it is possible that they would prove very suitable for the purpose. A couple sown on either side of, and quite close to the young vine, when this is being planted, would give something to spray with lead arsenate before the vine buds burst into growth.

The suggestion is made in the hope that it may prove of service during the coming planting season. Of course, other plants might prove more suitable than the soya bean; it is one, however, which seems to be very acceptable to the insects.

OTHER METHODS.

There are, no doubt, other ways of combating these troublesome insects, but, so far as Victorian experience is concerned, arsenical poisoning has given the best results. Hand-picking around the young vine, though effectual, is too laborious, and consequently costly, as well as very slow. In France, hand-picking by the light of a lantern at night, when the insects are above ground, is often recommended.

The use of strongly smelling substances in the soil, around the vine, in order to render it an unsuitable refuge for the insects during the day time, has been recommended. Naphthaline and several proprietary mixtures, such as "Vaporite" and others, seem to be suitable for the purpose, as well as watering with solutions of Benzole emulsion, Sulphide of Potassium, &c. Some of these have been tried, and good results are claimed for them, but further experiments are necessary before they can be confidently recommended.

In the case of severe outbreaks, a combination of the various methods mentioned above is advisable.

VINE DISEASES IN FRANCE.

(*Continued from page* 398.)

F. de Castella, Government Viticulturist.

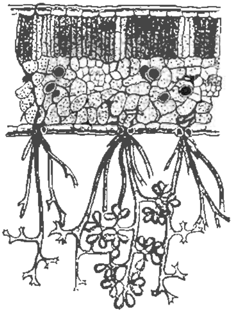
MILDEW (*Plasmopara viticola*).

Mildew, or *Mildiou*, as it is phonetically spelt in French (the "W" in that language being pronounced like our "V"), is caused by a fungus radically different from that of Oidium, in its botanical relationships, in its mode of life, and in the methods by which its ravages can best be combated.

Though its recognised botanical name is now *Plasmopara viticola*, it was long known as *Peronospora Viticola*, and is still often referred to in France, as well as in America, as *Peronospora*.

Botanically, it belongs to the family of *Peronosporeæ* and the great fungus group of *Oomycetes*, and is closely allied to the potato blight (*Phytophthora infestans*).

1.



2.

DOWNY MILDEW (*Plasmopara viticola*).

1. Under surface of vine leaf showing characteristic white tufts (*after Chancrin*).
2. Diagrammatic section of leaf attacked by mildew showing mycelium (black) between cells of tissue and summer spore-bearing filaments on under side. The large round bodies, buried in the tissues of the leaf, are oospores (*after Vialla*).

Though long known in the eastern States of the North American Union, it was not until 1878 that mildew was observed in France; after this, its spread was exceedingly rapid, not only in France, but throughout the whole of Europe, the damage done varying much according to local climatic conditions. Should these be suitable, it becomes one of the most serious scourges that vignerons can have to fight against.

In outward appearance the disease is easily recognised and distinguished from other fungi. It attacks all growing parts of the vine, but it is on the leaves that it can be most readily recognised. Its American name of Downy Mildew very aptly describes it, and explains the chief difference which distinguishes it from Powdery Mildew or Oidium. The latter fungus has the appearance of a thin white or greyish powder, the general

appearance gradually becomes darker owing to the discolouration of the underlying tissues. This powdery appearance is distributed generally over the leaves and other growing parts on the upper and under surfaces alike. In the case of Mildew the white downy efflorescences, characteristic of the fungus, are almost invariably situated on the under surface of the leaf. The upper surface, at these points, presents a discolouration, slight, and usually yellowish at first, but finally becoming of a dark reddish brown colour. The downy tufts, usually of a milky white colour, but sometimes greyish, are very distinct, and cannot be mistaken for any other fungus. In the case of a bad attack, the leaves fall off, sometimes together with the leaf-stalk; at others, they detach themselves at the junction of the limb and the stalk, leaving the latter adhering to the vine.

The complete suppression of the leaves, when the berries are about the size of buckshot, naturally entails the destruction of the crop, and this would frequently be caused but for spraying with copper mixtures, which have now become indispensable operations in all the vineyards of France. By means of these sprayings, more or less complete protection of the foliage is achieved. Injury to foliage, even when not sufficient to greatly reduce the yield, may lead to a reduction in the quality of the wine. Pessimists sometimes tell one that the wines of France are not equal to what they were a generation ago; they attribute this to the fact of grafting on resistant stocks, a contention which has been recently and abundantly proved to be absolutely false.* Reduction of quality, if any, is due to the ravages of Mildew, and, in certain seasons at least, there can be no doubt that such reduction does occur. In addition to this indirect damage, the fruit of the vine is subject to direct attack, and this at different periods of the growing season.

An early invasion of Mildew, about blossoming time, or shortly after, when the bunches are young and tender, may bring about the complete destruction of the crops in the space of a couple of days. This form of the disease is termed in French *Mildiou de la Grappe* (bunch mildew). Such disastrous visitations are sometimes experienced as a result of neglect of the first preventive treatments, which, experience has shown, should invariably be applied. A little later in the season, the bunches may also be attacked. Their appearance, more or less covered with the efflorescence of the fungus, has led to the term *Rot-Gris* (Grey Rot) being used at this stage. Berries thus attacked wither and dry up. If attacked before maturity, when the fruit is about to change colour, the whole of the pulp is invaded by the fungus. The fruit then becomes soft and discoloured. This form, termed in French *Rot-Brun* (Brown Rot), may seriously injure the quality of the wine.

The diagram reproduced shows the mode of life of the Mildew fungus. Its mycelium grows exclusively in the interior of the tissues; never on the surface, as is the case with Oidium. It is only the fructifications which appear on the outside of the plant. These, as shown in the diagram, consist of much branched filaments bearing the conidia or summer spores by which the spread of the fungus is carried on during the summer months. These are produced in enormous numbers. They are light and easily carried by the wind, facts which explain the extraordinarily rapid spread of the disease. These spore-bearing filaments constitute the milky white down, visible to the

* The effect of grafting on resistant stocks on the quality of the wine was exhaustively discussed at the International Viticultural Congress of Angers in 1907. The evidence there collected from all parts of the world proved that the fact of grafting on resistant stocks led to no reduction in the quality of the wine.

naked eye, which occur on the under surface of the leaves, and also on unripe berries, attacked by Mildew. In the thickness of the leaves are shown the oospores, or winter eggs, by which the perpetuation of the disease, from one season to another, is insured.

It is of interest to note that in the closely allied Potato Blight fungus (*Phytophthora infestans*) this form of reproduction has not as yet been observed.

It was at one time thought that the removal of all leaves and their destruction by fire would, by the elimination of the oospores, constitute a useful preventive treatment, which would prevent, or at any rate reduce, the intensity of the first outbreak of the fungus, the following season. Experiments, however, showed the absolute futility of such treatment. The spread of the fungus is so rapid that one single spore, germinating in the spring, would be sufficient to invade a whole district, provided, of course, that climatic conditions were suitable.

The conditions necessary for the development of the fungus are such, fortunately for us, as do not occur in Victoria, at least, not in the districts where the vine is now cultivated. Simultaneous warmth and moisture are indispensable. Such conditions are frequently realized in France. In fact, in Southern Europe generally, where the warm southern wind is charged with moisture, it is the cold north wind which is dry. This is the reverse of Victorian experience. Our warm wind is the dry north wind, fatal to all forms of fungus life. Even on the coast side of the Dividing Range, dry and warm north winds are frequent, such as are absolutely unknown in Europe.

In its moisture requirements, Mildew differs altogether from Oidium. The latter can develop if the air be moist or muggy; the former must have drops of water (either dew or rain), at a suitable temperature for the germination of its spores, and this frequently repeated before an outbreak can attain any seriousness. Conditions are frequently suitable for Oidium here, but never for Mildew. The moist warm winds of France, the heavy dews resulting from them, and warm rains of frequent summer storms, provide the drops of water in which Mildew spores readily germinate. The difference between dry Australian heat and the oppressive heat of summer in viticultural Europe, has only to be experienced in order to understand our immunity from similar fungi.

As regards treatment, the situation of the mycelium in the interior of the tissues, renders direct or curative methods, such as are so successful in the case of Oidium, hopelessly powerless. Preventive measures alone can be of use. Treatment has for its object the prevention of the entry of the fungus into the tissues of the plant. This can only be achieved by spraying the whole of the surface, liable to attack, with a substance capable of dissolving in the dew or raindrops, and thus rendering them unfit for the germination of the fungus spores. The spraying substance must not be too soluble or the first shower of rain would wash it away. A suitable substance has been found in various copper salts of slight solubility. The Bordeaux mixture (lime and copper sulphate), so well known to orchardists, is the oldest and, even now, the standard treatment; many variations of it are in general use. These will be dealt with in detail later, together with some other metallic salts, notably those of mercury, and even of silver, the most recent innovation.

The spray must be fine and even, so that no portion of the vine surface is left untouched by it, sufficiently large to contain a dew or raindrop. Three sprayings are considered necessary in order to insure protection

against Mildew, even in the south of France, when the disease is less virulent than in moister parts.

First Spraying.—When the young shoots are about 6 inches long.
Second Spraying.—Immediately after blossoming.
Third Spraying.—About six weeks after the second, or before the fruit commences to change colour.

In moister regions, and exceptional seasons, these three regulation sprayings must be supplemented by additional ones. It is not uncommon in districts very liable to Mildew to give as many as six or seven sprayings. Sometimes the supplementary treatments are made in the shape of copper containing powders applied in exactly the same way as sulphur. At the vineyards of the Salins du Midi Company, near Montpellier, the three sprayings cost annually 17s. 1d. per acre, of which sum 7-15ths represent the purchase of copper sulphate.

Oidium and Mildew are occasionally combated simultaneously, by the addition of sulphur to the Bordeaux or other copper compound, used to spray for the latter.

The quantity of spray mixture required varies greatly according to circumstances. In the Burgundy district, where vines are planted very close, about 60 gallons are required to spray an acre.

For many years, the Knapsack spray pump, of which there are many models, was generally employed for spraying vines. Within the past few years, considerable improvements have been made, large traction machines, drawn by horses or mules, and capable of treating several rows at a time, are largely used. An illustration here reproduced, shows another form, in which the spraying mixture is carried on a pack horse, and forced through the nozzles by means of compressed air. Such an arrangement is very convenient in districts where summer pruning is not practised, and spray pumps mounted on wheels could not pass in the rows.

COMPRESSED AIR SPRAYING MACHINE.

BLACK ROT (*Guignardia Bidwellii*).

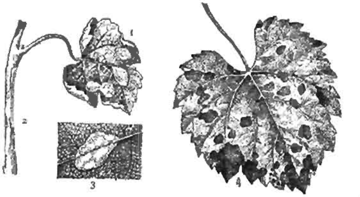
This deadly vine disease cannot be passed over, in spite of the fact that its appearance in Victoria is even more improbable than that of Downy Mildew, for the reason that it requires considerably more moisture for its development than that fungus. In the south of France, it is practically unknown, but in many moister regions its ravages are very severely felt. Under climatic conditions suitable for its development, it is perhaps the worst of all fungus diseases of the vine. In the eastern States of the North American Union, it is mainly responsible for the fact that European vines cannot be successfully grown, even if grafted on resistant stocks.

The appearance of the disease will be understood from the illustration. Though it attacks all growing portions of the vine, it is to the grape that the damage is most serious. When these are attacked they first appear as

though bruised; the whole berry becomes invaded, turns brown and dries up. The presence of a number of minute black spots is characteristic—these constitute the *Pycnidia*, or summer spore-bearing bags of the fungus.

On the leaves, the disease is confined to small brown patches, also showing minute black spots. Though damage to the foliage is slight, it must be carefully observed, since invasion of the young leaves precedes the invasion of the fruit. It gives urgent warning of the need for preventive treatment.

Black Rot is a slow-spreading disease as compared with Mildew. The *Pycnidia* appear to be a less efficient mechanism for spore dissemination than the external branching filaments of *Plasmopara*. Its mycelium, being internal, can only be combated by preventive spraying, such as the copper compounds applied against Mildew. In fact, the same treatment is effectual against both fungi, though the best time for application differs.



BLACK ROT (*Guignardia Bidwellii*).

1. On young leaf. 2. On cane. 3. Spot on leaf (actual size). 4. On mature leaf. 5. On grapes (*after Chancrin*).

Careful study of the development of the disease has enabled the most opportune moment to be fixed upon for different localities. In the successful way in which the disease has been systematically fought in the Cadillac district, near Bordeaux, by carefully following the instructions sent out from time to time by the Comice, or Viticultural Association, we have an example of the value these co-operative associations can prove to their members. Our immunity from attack by it prevents further space being here devoted to this interesting, though most injurious fungus.*

BLACK SPOT OR ANTHRACNOSIS (*Manginia ampelina*).

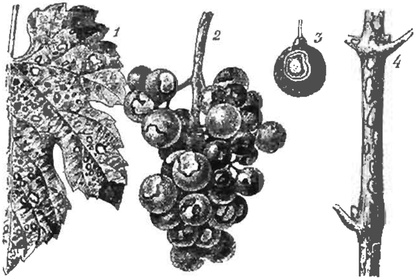
The fungi so far dealt with have been one and all imported into Europe from the United States of America. This fact is now conclusively proved. In Black Spot, on the other hand, we have a fungus which has been known in Europe since the very earliest times, as witness its mention by agricultural writers of ancient Greece and Rome. It has also been known in Australia ever since the vine was first introduced.

Though long known under the name of *Sphaceloma ampelinum*, and later as *Glæosporium ampelophagum*, these names, based on relationships which were not thoroughly traced, must, since the exhaustive researches of Viala and Pacottet†, be abandoned in favour of that of *Manginia ampelina*,

* Those interested are referred to the series of articles by M. A. Prunet in *Revue de Viticulture.* Vol. IX., &c.

† *Revue de Viticulture.* Vols. XXII, XIV, XXV, &c

the name by which the fungus is now known to science. Its complicated life history and the numerous forms under which it can exist, for it is one of the most polymorphic fungi known, cannot here be gone into in detail. Its external manifestations are almost too well known to need description, at least they were so a few years back; owing to the dryness of recent seasons it seems to have almost disappeared from many districts of Victoria. The abundant rainfall of last summer has caused its reappearance in many localities, and it is probable that, in the near future, more attention will have to be devoted to this fungus than has been necessary for some time past. The illustration here reproduced will enable it to be recognised with certainty; the lesions produced on the vine canes are not, like those of other vine fungi, merely superficial, but penetrate deeply, often right through the bark, and into the wood. These deep scars are produced during the growing period whilst the tissues are young and tender.



BLACK SPOT, OR ANTHRACNOSIS (*Manginia ampelina*).

Like Mildew and Black Rot, the mycelium is internal and beyond the reach of fungicide sprays. Preventive treatment can, therefore, alone give satisfactory results. Unlike Mildew, however, in the case of which the destruction of the winter spores has given entirely negative results, Black Spot can be most effectually combated by treatment directed towards the destruction of the *sclerotia*, or most frequent winter form of the fungus.* These small bodies are situated on the characteristic scars on the canes.

Acid sulphate of iron solution has proved a very suitable agent for their destruction. It causes them to crack, shrivel, and gradually lose their vitality. Some authorities contend that this action is due solely to the sulphuric acid contained in the mixture, and recommend a simple 10 per cent. solution of sulphuric acid. Whether this view be correct or not, the acid sulphate of iron solution is still the standard treatment in France. Being much less acid, it is far more convenient and safer to handle, and there seems to be no reason to prefer the plain sulphuric acid, which, though efficacious, is not more so than acid iron sulphate. The standard formula is as follows:—

Sulphate of Iron (commercial)	35 to 40 lbs.
Sulphuric acid	10 fluid ounces.
Hot water	10 gallons.

* A sclerotium is a tuber-like reservoir of reserve material which remains dormant for a time, ultimately producing shoots which bear spores.

The sulphate of iron is placed in a wooden tub or earthenware jar—on no account in a metal vessel. The sulphuric acid is poured over it†, and the water (preferably boiling) then added, stirring until dissolved.

Special spray pumps are obtainable in France, with glass receptacles and acid proof nozzles, but application with a brush or mop made of rags, gives quite satisfactory results. Care must be taken to insure the solution wetting every portion of the spurs or rods left at pruning, for it is on the wood of the previous season that the majority of the *sclerotia* of the fungus are to be found.

The time for this treatment is in very early spring, just before the buds burst into growth. If Black Spot was very prevalent the previous season, two treatments are recommended, the first one about a month before the commencement of vegetation and the second immediately before it.

Bordeaux mixture and the numerous other copper-containing sprays so effectual against other fungi, appear to have no effect against Black Spot, at least not against its resting stages. They are never recommended in France; nevertheless, the frequent summer sprayings with such substances seem to have some restraining influence on Black Spot, which, since their regular application in order to combat Mildew, seems to be less prevalent in France than it was a good many years back, before Mildew and Black Rot were known. This fact was mentioned to me by several experienced vinegrowers near Montpellier. Copper treatments, however, are never recommended against the disease. The only summer treatment applied is a dry application with the sulphur bellows or sulphuring machine of mixtures of quicklime and sulphur. In very severe attacks these applications are repeated every fortnight, commencing with 1 of lime to 5 of sulphur, and increasing the proportion of lime to 3 to 5 for the final application.* The preventive acid iron sulphate treatment is looked upon by French authorities as being by far the more effectual of the two. It should be regularly applied in moist situations where the disease is more apt to prove injurious, and to vine varieties susceptible to it. The Black Spot fungus seems to develop itself slowly, and for a long time after infection—moisture alone seems necessary for its evolution. It does not, like Mildew, need moisture and warmth combined—these facts explain why the treatment, which has proved most successful against Black Spot, is so radically different from that needed to combat other vine fungi.

(*To be continued.*)

TOBACCO CULTURE.

(*Continued from page* 394.)

T. A. J. Smith, Tobacco Expert.

SEED SELECTION.

As tobacco is needed for so many different purposes, and as special types are required for each, it will readily be seen that pure seed of every variety used is of great importance so that the characteristics valued in each may be preserved. These can only be maintained by systematic selection and great care in preventing cross-fertilization, except where cross-breeding is intended with a view to improvement in shape, vigour, and quality.

* Cercelet, *Revue de Viticulture*, Vol. XXIII, p. 478.

† When mixing the 10 per cent. sulphuric acid solution previously mentioned, the acid should be poured into the water in a thin stream to avoid dangerous splashes.

Tobacco, if not carefully watched, has a tendency to lose its type under certain circumstances. Where different varieties are grown within a few miles of one another, cross-fertilization is common, owing to the pollen being carried by bees and other insects, or the wind. The result is that, where no care is taken to prevent inoculation, a type is soon lost, and it is found impossible to maintain the qualities required in the different tobaccoes.

Even without cross-fertilization, a variety planted in a soil and climate not suitable will, in three years, lose its useful characteristics altogether and a fresh importation of seed be found advisable.

During the last ten years it has been clearly proved that cross-breeding, with knowledge, has been the means of producing tobacco with better colour, texture, and burn, in addition to heavier yields. Judicious seed selection will also control the same results.

The tobacco plant is self-fertile; consequently, no cross-fertilization is necessary, provided the plant is holding the type required. The vitality of the seed is wonderful, considering its diminutive size—from 300,000 to 400,000 seeds to an ounce. A single plant will, in some varieties, produce this quantity, about 70 per cent. being fertile. The life of tobacco seed is from 10 to 20 years, when properly cared for: though, after 10 years, a smaller proportion will germinate, and the older the seed the slower the germination.

An experienced grower will, in a good season, save enough seed to last him for ten years. There is less risk in this way of deterioration than if the seed be saved in every succeeding year. Care must always be taken that the plants selected are acclimatized at least one year, if grown from imported seed.

In selecting plants for seed bearing, the grower should have in his mind the following ideals:—

1. A vigorous healthy plant with a tendency to early maturity. This means less risk from frost, and a shorter growing period which will entail less working expense. The quicker tobacco is grown, especially for wrapper leaf, the better the quality. Some of the best leaf, from the time it is transplanted to the harvesting stage, is only 12 weeks in the ground; heavier plug tobaccoes will be from 16 to 20 weeks. The seed from a vigorous plant, grown in a season clean in respect to fungus and other diseases, will naturally produce plants less liable to disease.

2. Size, number, and shape of leaves must also be considered. These objects will depend on the purpose for which they are grown, and the quality of the soil in which they are produced. The size for heavy plug types can hardly be too large, leaves of this kind being sometimes as much as 39 ins. in length and 24 ins. wide. But where such large leaf is grown, it is well to endeavour to keep the size of the midrib as small as possible. The lateral veins should not be too large or prominent and should be even distances apart. If they appear close together, it is indicative of the seed running out, and such plants should be avoided. For cigar and plug filler size is of no great consequence, except in so far as heavy yields are concerned.

The number of leaves will depend chiefly on the quality of the soil used; a rich soil will develop a larger number than a poor soil, so that no hard and fast rule can be laid down here, but each grower must use his own judgment, according to the conditions he is working under. In a rich sandy loam, on which heavy plug leaf is being produced, a strong

plant will mature from 20 to 25 leaves. In choosing a seed plant from such a crop, not less than 20 leaves, exclusive of the four top and four bottom leaves, should be selected. Where, however, a poorer soil is in use, from 10 to 15 leaves will be found sufficient for the plant to mature. It is better to err on the side of having rather too few, than too many leaves, so that each may be properly developed and of as nearly as possible uniform size.

Where more leaves are grown than the plant can produce to their full size, extra labour in handling during the stripping and classing will be required, and a poorer quality obtained. If, however, a thinner textured leaf is the object for cigar wrapper purposes, then a greater number of leaves can be left on with advantage. Wrapper leaf is grown not so much for its smoking qualities, as for appearance, and comprises only a small proportion of the cigar or plug when manufactured. It must always be remembered that the middle leaves, from the fourth at the bottom to the sixth from the top of the plant, are the best.

As a general rule, the wider the leaf, in proportion to the length, the greater the amount of usable material is present, with a smaller percentage of waste in the shape of midrib, which comprises from 24 per cent. to 30 per cent. of the whole weight. It is only natural, therefore, that buyers should prefer a wide leaf. The heart shape of the Hester and Hyco varieties is very popular.

3. *Consideration should also be given to the easy working qualities in* some plants, as compared with others. Plants which grow the leaves close together on the stalk, and which have a quantity of frill round the butt of the leaf, are not so easily suckered as those which have the leaves further apart, neither do they cure so well in the shed, as the leaves are more covered one with the other, and consequently do not get the air so readily, or evenly.

The first desideratum then is to select healthy, vigorous plants, true to whatever type is required. As soon as the flower bud appears, in order to prevent cross-fertilization, tie a square of cheese cloth or paper bag over the top to prevent access of insects or pollen from other plants before the flower makes its appearance. Only the centre bunch of buds or pods should be reserved; all lower branches bearing flowers should be removed, also the top five or six leaves, with the object of growing only so much seed of heavy, virile, qualities as the plants can mature. As the plants grow, the bags should be removed from time to time and tied loosely round the stem.

As the plant ripens, the seed pods turn brown; the leaves can then be stripped and cured and the stalk cut 2 to 3 feet below the pods, and hung with the tops down in a dry situation in the shed. The bags are left on and will catch any seed which may shell; if they are removed, such seed, being so small, would not easily be recovered.

During the growth and before putting them in the shed, it is well to examine the plants for a small green caterpillar which is given to attacking the pods and rendering them useless. The seed plants should also be hung where mice cannot attack them.

Five or six plants are sufficient to save for seed under ordinary circumstances, but it is wise to choose twice or three times that number and label each plant according to its variety, &c. Then, as they mature, make a final selection of those best fitted to produce the largest yield of the most valuable class of tobacco desired. All suckers should be kept down; many

growers go so far as to remove, from time to time, the weaker capsules or buds on the bunch in order to send all the strength possible into those left.

Do not be disappointed if the leaves taken from the seed plants are not as good quality as those taken from topped plants. They are never so good, owing to the fact that the effort to mature the seed has robbed the leaves of some of their virtues.

When the seed pods have all turned brown, and are thoroughly dry, the seed can be threshed out by rubbing the pods between the palms of the hands over a sheet of paper. The seed should then be put through a fine sieve and the fine chaff blown away. Each pod should contain from 1,000 to 4,000 seeds. When thoroughly dry, the seed should be placed in Mason, or other jars, and the lid screwed tightly down. Each jar should be labelled with the variety and date of saving, and kept in a dry situation. Blowing machines are used for separating the light seed from the heavy. The latter is just as desirable in tobacco as any other crop.

Tobacco seed weighs 35 lbs. per bushel. One farm in America produces from 100 to 125 bushels per annum, the yield per acre being about 4 bushels.

To test the vitality of tobacco seed, sow thinly on a piece of dark woollen cloth and moisten the whole, then fold the cloth and keep in a warm situation and moisten with warm water from time to time. In nine days the sprouts will show if the seed is good. A further test is to drop a little seed on a hot piece of tin or iron; if good, the seed will pop; if dead, will burn. An experienced man can tell by rubbing the seed on the palm of the hand; if too old the seed will crumble, but if good will roll without breaking.

(*To be continued.*)

SEEDS AND SEEDING.

(*Continued from page* 410.)

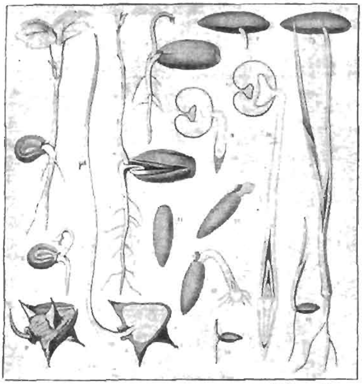
L. Macdonald, Horticulturist, Dookie Agricultural College.

GERMINATION.

In preparing land for the reception of seed, due consideration should be given at the outset to the three cardinal requirements of all our agricultural seeds, viz. :—(1) Warmth; (2) moisture; (3) air. Preparation tillage will always play an important part in the partial regulation of these elements. Although unable to control climatic conditions, the farmer or gardener who exercises good judgment may, to a greater or lesser extent, avoid the disabilities of unfavourable climatic conditions.

Warmth is controlled easily enough under cover, and in the field is influenced by good drainage and tillage. Tillage should always be designed, as far as possible, to suit, not only germination and subsequent growth, but also the seasons. As a rule, the land should be better prepared for summer crops than for autumn or winter sowings. If the seed bed is left rough for summer sowing, moisture will evaporate readily, and the seed lying in the large interstices will be likely to dry out; while a well-broken surface mulch will retard evaporation and the seed will obtain the benefit of conserved moisture. With those soils that are lacking in humus, very fine tillage in autumn or winter is often followed by dire results.

Hillside fields are scoured out badly owing to the tendency of such soils to "run," and the flat country fields are a series of puddles, due to the soil running together on top and becoming impermeable. When such land dries, "caking" takes place, and the most unfavourable conditions for germination and growth are presented. Air is excluded. The closely compacted surface soon dries out. The ground cracks and young roots are lacerated or torn asunder. The air enters freely and the soil and roots of young plantlings are subjected to great variations of temperature. Again, if the wet weather continues, the soil becomes cold, sour, and waterlogged; and excess of moisture at low temperatures without a sufficiency of air is opposed to the well-being of agricultural seeds.



GERMINATING SEEDS AND SEEDLINGS. (After Kerner.)

1. Seedling of Nasturtium. 2. Same in early stage of development. 3. Water Chestnut, embryo emerging. 4. Later stage of development. 5. Seedling of Austrian Oat. 6. Same, further developed. 7. Seed of Date, embryo emerging. 8. Same, eight weeks later, showing development of roots and scale leaves. 9. Young Date in longitudinal section. 10. Further developed. 11. Seed of Reed Mace. 12. Same, with protruding embryo. 13. Same, later stage of development. 14 and 15. Seedling of Sedge.

Where rough preparation is carried out for winter crops, the rain gradually breaks down the soil, which does not then set so readily, and the seed or young rootlings get the benefit of what little warmth is available. However, the surface should never be so rough as to interfere with effective seedage, or subsequent harvesting operations. In the north, with those crops that require early autumn sowing, and that germinate with little moisture, such as peas, rape, &c., fine tillage is often advantageous. They can be planted deeper, and thus get the benefit of conserved moisture. Where light showers occur they get an early start, and make such rapid progress that bad phases in the soil are prevented.

It takes little moisture to start the process of germination in the majority of seeds. The moisture that initiates these growth processes usually enters by the micropyle, or other aperture, or soft portion of the

seed coat. In many seeds it is eagerly absorbed by the seed coat itself, especially those with a mucilaginous envelope, as flax. Frequently there are special absorbative systems developed in connexion with these apertures. If the seed coat is not very thick or the integuments not very hard, the moisture gradually finds its way to the embryo by osmosis. The absorption of water by the embryo, or, in some cases, the endosperm, leads to an increase of size and a consequent rupture of the seed coat. Where the latter is thick and hard, it usually has some soft portion through which the embryo emerges, as in the cocoanut and sugar-cane. The radicle, being situated in close proximity to the micropyle, is usually the first to emerge; but in many monocotyledonous seeds the cotyledon is the first to appear.

The seed coat is often a hindrance to germination. This is especially so with many leguminous and drupaceous seeds. In these cases, soaking in hot water, cracking, or mechanically injuring the integuments in some way, is adopted to assist the water in reaching the embryo. Germination then takes place more readily. Many of the half-hardy seeds, as melons, are sensitive to the presence of moisture, and depreciate quickly if stored in damp places; while hard seeds, such as cannas, acacias, kennedias, goodias, &c., will remain in the ground for months without apparent injury. Seeds of our stone fruits are often stored in moist sand during the winter. This permits time for the moisture to gradually rot the outer shell, and gain access to the kernel in time for spring sprouting.

According to Haberlandt, the minimum temperature for germination lies between 32 and 40.64 F. in the case of wheat, oats, barley, and peas; between 40.64 and 50.90 F. in the case of maize; between 50.90 and 60.08 F. in the case of pumpkins and tobacco; and between 60.08 and 65.3 F. in the case of melons and cucumbers. It will be seen that the half-hardy seeds require higher temperatures for germination, hence it is inadvisable to sow them in the open when the ground is cold and wet. Seeds will not germinate below 32 F. owing to water freezing at that point, and thus preventing its absorption by the tissues of the seed. However, many seeds, such as the common annual meadowgrass (*Poa annua*) and chickweed (*Alsine media*), will germinate at slightly above that temperature.

During the process of germination, care should be taken to enable the seed to obtain a sufficiency of air, as respiration is particularly active at that time. This applies especially to those seeds the reserve products of which are of a fatty or oily nature, as more oxygen is utilized in oxydizing the fats and oils. It is of some importance, therefore, that the growers have a knowledge of the conditions demanded of different kinds of seeds.

Since good germination is best effected in some friable or granular medium, and is the result of growth processes brought about by the action of warmth, moisture, and air in proportions suited to the special requirements of the seed, it is manifest that if these elements vary to a great extent, or are continuously deficient, or in excess, the conditions will be in such degree unfavourable, and will militate against the best results. In field practice, the conditions often vary greatly and, when unfavourable, the weaker seeds fail. Hence, freer sowings should be made at certain seasons, or when the conditions promise to be unfavourable.

Under laboratory conditions, or in forcing frames or houses, where conditions can be controlled to a nicety, seeds usually show a higher vitality test as against the viability (*i.e.*, powers to grow) test in the open ground. Although the seed tester is of great value in indicating the vitality of seeds, or showing their germinating qualities, it does not afford an accurate criterion of their viability, or ability to grow under the less favourable

conditions of the field. Many seeds that from various causes, such as unripeness, age, and bad storing, are weak, will not, even under normal conditions, survive long enough to establish themselves as satisfactory plants.

SELECTION OF KIND OF VARIETY.

From an economic standpoint, a proper selection of varieties has many advantages. It prevents a congestion of operations and thus minimizes waste. It admits of a more effective utilization of plant owing to the extension of sowing and harvesting operations. With fodder crops, it prolongs the feeding period, and with perishable products the marketing period. The intelligent gardener utilizes the early or the late maturing qualities of flowering or culinary plants to suit his various needs. Many varieties of our garden plants show a special adaptability to certain seasons; not only this, they evince peculiarities in development in some districts that are little marked or entirely absent in other districts. Experience in the cultivation of any given species or variety of plant in a certain district, and a close observation of their habits, are the surest way to a proper selection in this respect; but this is often tedious, expensive, and fraught with many disappointments. New settlers or beginners ought to avail themselves of the experience gained by others under conditions similar to those under which they propose to work. This is often the means of saving both labour and expense. Where it is not available, experimental work should be carried out as much as possible.

In some quarters conservatism and distrust are shown by growers towards "new things." Many of them still cling to the kinds and varieties that served their fathers well, despite the insistent challenge of returns each season. Doubtless many of the old kinds are good and should not be inadvisedly abandoned, yet opportunity should be given to new varieties to prove their merit. In many cases this opportunity is given in a meagre and sceptical way. However, some warrant exists for the suspicion with which growers regard new kinds that are sold with a lot of descriptive matter. In many cases they are varieties whose constitutional tendencies are not properly established, or which flourish under one special set of conditions, but when subjected to more extensive tests in different districts, their special qualities soon peter out. The selection of kinds will be influenced to a considerable extent by:—

1. The locality.
2. The season.
3. The prospective economy of such crops in relation to conditions.

The selection of variety will chiefly depend on:—

1. The suitability to season.
2. The maturing period (early, mid-season, or late).
3. The ability of such variety to resist disease or other injurious agencies.

Of course, the grower's object is to secure a variety that possesses those qualities best suited to his needs and conditions. Many excellent varieties of plants and trees lose their best characteristics when grown under unfavourable conditions, and are easily eclipsed by the less classical kinds, although within a normal range of conditions the former are much superior.

With most farm and garden crops, and also flowering plants, a number of varieties are in general cultivation from which to make a selection. These include early, mid-season, and late kinds; also those best suited to special seasons or conditions. With fruit trees, the period of maturation or ripening of the fruit is well defined, and proper regard should be given to the selection of varieties when starting new plantations. In the vegetable garden, many beginners fail at the outset by assuming that any variety

will do. This is, of course, not so. The right variety will often make all the difference between success and failure. With turnips, for instance, some varieties have narrow leaves, while others have large broad leaves. The latter, if planted closely, draw a lot in dull wet weather; while the former thrive under such conditions, but do not succeed when the sun heat is strong.

It is to be regretted that few emoluments await the creator of new types of plants. An improved variety may mean an increase of thousands of pounds in trade. Observe the effect of the Wealthy apple and Bartlett pear in America and Federation wheat in Australia. Not only does a good new variety produce more than the old; but, being a more desirable article, it will quickly capture the markets from the less attractive kinds. Thus prolificacy and commercial value are increased. The influence of one patient breeder on the improvement, or popularizing, of certain species of plants is extraordinary. In this respect we may cite Burbank with plums and Farrer with wheats. These men have demonstrated the potentialities in common forms of plant life, and have shown how infinitely variable are the inherent qualities possessed by such. There is probably no more fascinating subject of investigation than that of the variation of plants, and no more utilitarian way of enriching one's country and mankind, than by the improvement of old, and the creation of new, varieties of agricultural plants.

Gathering and Storing.

As a rule, seed should be gathered when fully ripe. Owing, however, to the peculiarities of some plants in ripening their seed suddenly and casting it some distance from the parent plant by a violent rupture of the seed coat, or by the aid of a special appendage, it is advisable to gather the seed when fully developed but before complete hardening. This is particularly so in the case of many small seeds that are difficult to gather. It is often a good plan to lift carefully the whole plant when a good quantity of the seed is fully developed but not hard and dry, and allow it to complete the ripening process on the plant.

In collecting seeds, trueness and improvement in the type should always be the chief objectives. When a good variety is obtained, constant selection should be observed in future years to maintain its characteristics. Although it is generally accepted that there is a dominant tendency for "like to beget like," yet absolute stability is not found in the improved forms of plant life. Once the chief factors (cultivation and selection) that are responsible for the improvement and maintenance of the type are withdrawn an inherent tendency to "run out," or revert, is ever ready to assert itself. This tendency is usually most apparent in those plants that vary easily or are the furthest removed from original types by breeding. According to L. L. Vilmorin :—

1. The tendency to resemble its parents is generally the strongest tendency in any plant.
2. But it is notably impaired as it comes into conflict with the tendency to resemble the general line of its ancestry.
3. This latter tendency, or atavism, is constant, though not strong, and scarcely becomes impaired by the intervention of a series of generations in which no reversion takes place.

Thus, for instance, a good variety of cabbage may, where proper cultivation and selection are observed, be grown for years without deterioration, but if neglected for one or two seasons a sudden reversion takes place.

As a rule, in gathering seeds the general character of the plant should be considered of more importance than the particular attributes of the part

from which the seed is taken. For instance, in gathering melon seed, it is better to select seed from plants that are carrying a good number of well-developed fruits, than from one that has only one or two large-sized fruits. Again, it is not advisable always to select seed from the most vigorous plants or flower heads. This is particularly so with such plants as some of the Brassicas. The seeds from shoots that spring from axillary buds or side branches from the main flower stem are often better than those from the centre head. With abnormally vigorous plants, the seed has a tendency to lack uniformity, probably owing to the preponderance of certain food contents in the seed and the somewhat defective transmission of typical propensities resulting directly from excessive growth in the plant and its inherent tendency to change, and indirectly from environal influences. Inversely, for similar reasons, disease-ridden plants do not produce good seed; in this case, however, it is due to lack of growth.

Under-ripe seeds lose their vitality early. Good germination may be obtained from some under-ripe seeds, such as peas, tomatoes, etc., and the produce from such often exhibit variations in season of maturing, or quality of fruit, that are of economic advantage, but the seeds quickly deteriorate. For general purposes, only fully ripe seeds that have been properly "cured," or dried, after being gathered, should be kept.

Seeds are best stored in a dry, well-aired place of uniform temperature, where they will be free from the attack of insects. Strong paper or cloth bags and tight fitting boxes are suitable for storing small lots; while bins of suitable dimensions should be used for large lots.

LONGEVITY.

It is not intended to submit here a table approximating the life or vitality of seeds under normal conditions. The object of the writer is more to indicate those factors that have an important bearing on the longevity of seeds generally and that come within the sphere of the average horticulturist or seed-raiser. Where further information is desired, *The Vegetable Garden*, by Vilmorin, should be consulted, the tabulated lists of which are reprinted in most works dealing with seeds; or the table prepared by Sturtevant from experiments at the New York Experiment Station; or the results of tests carried out under the auspices of the British Association for the Advancement of Science. Notwithstanding the diligence that has been observed in preparing these records in the life of seeds, and the value of such work in reference to storing, sowing, etc., it will be found that, owing to various agencies, such as varietal predisposition, mutability of type, soil, climate, disease, etc., great variations occur which make it impossible to deduce a law that will indicate the economic life in the generality of commercial seeds. Bad seasons, mechanical injuries in threshing, unripeness, disease, careless "curing" and storing, all tend to impair the life of seeds.

Many plants that are closely related according to our botanical classification differ widely in the relative longevity of their seeds. Even with varieties of the same species a wide variation will be found, not only in their normal life or vitality, but in their sensitiveness to injurious agencies. As a general rule, fresh seed should always be obtained if possible, owing to the fact that there are so many causes beyond the knowledge of the purchaser which may bring about a rapid deterioration in the samples. Even with the best seed there is from year to year a gradual falling off in vitality; this depreciation is accelerated in a greater or lesser degree by the presence of the agencies before mentioned.

It should be observed, however, that the seed produced in a good year or in a district suited to the production of that particular class of plant will be more likely to give a good germination and satisfactory results than that obtained in a poor year or in an unsuitable district. It is not chance that has been responsible for the popularity of seed from a certain district or country, as Hunter River lucerne or clover seed from Holland. These places are specially adapted for the production of that class of seed. It is found that plants do not produce good seed in every district in which they will grow well, the conditions for the proper maturation of the seed not being present. Hence, it is not advisable for the farmer or gardener to save all his own seed where a number of crops are grown. New "blood" should be obtained. The discriminating grower buys his seed from those districts which have the best reputation for the production of that class of seed, and from the produce of the good years (within a safe limit of time), if he can obtain it.

The size of seed should not be taken as an indication of its life. Many of the small seeds, such as tobacco and some of the *Eucalypti*, will retain their vitality longer than large seed such as the castor beans. Of the four orders which comprise the more important of our garden vegetables, the seeds of the *Cucurbitaceæ* and the *Leguminosæ* are usually the longest lived; the *Cruciferæ* are the most affected by unsuitable conditions, such as bad seasons, disease, etc.; and the *Umbelliferæ* are the shortest lived.

FEEDING BEES.

F. R. Beuhne, Bee Expert.

In Victoria, the past honey season has been quite abnormal, and only in a few instances have the anticipations of spring been realized. The absence of the normal hot weather which usually prevails during the blooming of the Yellow Box and Red Gum Eucalypts, greatly reduced the yield of honey, even in the Grampians country where there was a promise of a record yield. Notwithstanding the unfavourable weather conditions, yields of honey up to 300 lbs. average per hive were obtained in 200-colony apiaries. Over the rest of the State the returns were disappointing, while in the central districts north of the Dividing Range no surplus honey was obtained from the hives.

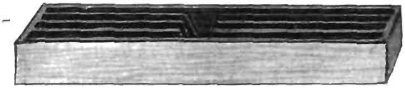
In many instances, the bees were unable even to gather sufficient for winter requirements, and large numbers of colonies in box-hives have already died of starvation. Many more will succumb from the same cause, unless attended to by their owners. This loss of stock from a preventable cause is regrettable, in view of the fact that a season of dearth of nectar is usually followed by a plentiful yield the next year.

It is one of the rules of bee-keeping that all colonies should be examined before the beginning of winter, to see whether they have sufficient stores to last them till spring. With colonies in frame-hives their condition as regards stores becomes evident to their owner in the course of the usual operations. Box-hives, however, are seldom looked at after the usual robbing time. There are, even now, many who are not aware that their bees are dead already, or will die of starvation before spring.

Although the proper time for supplying bees with winter stores is autumn, colonies still surviving, but on the verge of starvation, may even now be saved by judicious feeding. Honey, although it is the natural

food of bees, should not now be given them, as it excites them too much; there is also a risk of introducing the germs of brood diseases which may be present in honey of unknown origin. Sugar syrup is much more suitable for feeding bees while in a semi-dormant state.

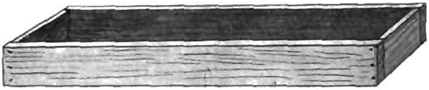
This syrup is made of two parts (by weight) of 1A sugar and one part water. The water is brought to boiling point and the sugar added,



1. SIMPLICITY FEEDER.

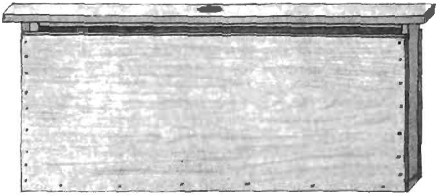
keeping the vessel on the fire and stirring continuously till the liquid is perfectly clear. On no account should the syrup be left on the stove or fire without stirring, as it burns very easily, and in that state is injurious to bees.

To supply this syrup to the bees without waste and drowning it is necessary to have a feeder. Fig. 1, known as the simplicity feeder, may



2. HOME-MADE FEEDER.

be purchased of a supply dealer at 4d. It is a block of wood, grooved out so as to leave narrow divisions to prevent bees getting drowned. This is the most convenient form of feeder for box-hives. The box is raised at one end, the feeder placed on the floor board, and the syrup poured in while still warm; the box is then lowered again. If a stock of bees is quite out of stores, at least 5 lbs. of syrup should be given and more later



3. MOST CONVENIENT FEEDER FOR FRAME-HIVES.

on, if required. It will be better to give the syrup as fast as the bees will take it than to continue feeding for days; for the longer the excitement lasts the more food is consumed without purpose.

As the simplicity feeder is rather small, several may be used under each box so as to shorten the time; or a home-made feeder may be used, such as shown in Fig. 2. It is a plain shallow box and may be made any size which the dimensions of the covering hive permit. To prevent leakage, hot wax should be run along all the inside joints, while a thin board

cut slightly smaller than the inside of the box will float on the syrup and prevent drowning of bees.

Both of these feeders may be used for frame-hives also; in which case they are placed on top of the frames with an empty half super or section super between the hive and the cover. When feeding is finished, feeders and half supers should be removed and the hive roof again put directly over the frames to conserve the warmth rising from the cluster of bees.

The most convenient feeder for frame-hives is that shown in Fig. 3. It is simply a frame boarded up to near the top bar, with a hole in the latter through which the feed is poured. It should be waxed inside to prevent leaking and have a strip of wood for a float. This feeder takes the place of an ordinary brood-frame in the hive to be fed. All that is necessary is to raise the hive cover and pour the syrup through the hole in the top bar. It is sold, waxed ready for use, at 1s. 6d.

Colonies fed during winter cannot be given sufficient food for breeding up in spring, but only enough to carry them along till warmer weather. They should therefore be examined periodically whenever a fine day permits, and another dose of syrup given when needed. When pollen is being carried into the hives, a sign that brood-rearing has commenced, the stores of syrup will be consumed much faster, and care should be taken that after bringing the bees through the winter they do not succumb to starvation in early spring.

In Victoria, the necessity for winter feeding rarely occurs, unless hives have been robbed or extracted without regard to the winter requirements of the bees. The present instance of bees, from which no honey was taken, having to be fed, is the first in the writer's experience extending over 25 years.

FARM BLACKSMITHING.

George Baxter, Instructor in Blacksmithing, Working Men's College, Melbourne.

INTRODUCTION.

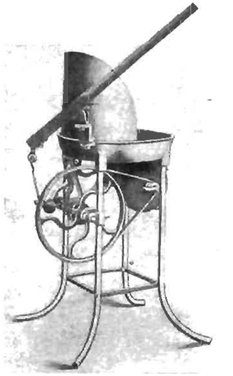
One of the main drawbacks of farm work is the difficulty experienced in being able to get blacksmithing work done. In hundreds of cases the nearest blacksmith's shop is many miles away. Frequently, the breaking of a bolt will throw a machine out of action and necessitates a stoppage of, perhaps, days. Under present conditions it must be carted to a blacksmith's shop or a smith brought to see the extent of the damage. The latter will then take the broken part away, repair it, and return to put it in position again. Often, these vexatious delays, which generally happen in the busy season, could be avoided by the farmer if he or his sons were to learn a few simple exercises in forge work.

On every farm there will be found a number of carpenter's tools, such as hammers, chisels, and saws. Whilst these are used by the farmer for the building of barns, stables, additions to dwelling, &c., without the slightest hesitation, and very often with considerable skill, he will hesitate to do anything with iron. This is no doubt due to the fact that carpenter's tools are in almost every house and are accepted as domestic articles, so that everybody lays claim to being able to do wood-work to a greater or lesser degree. With iron-work it is different, principally on account of the use of iron-working tools being confined almost exclusively to blacksmiths;

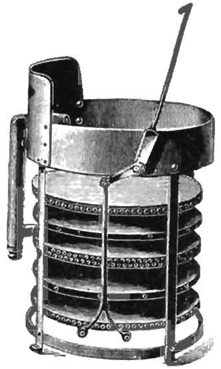
also, wood-work is more frequently required than iron. Further, it is possible to do it within a limited space or within the confines of the dwelling, whilst for iron-work a workshop and equipment are required.

On the farm, a knowledge of blacksmithing is invaluable. There are ploughs, harrows, harvesters, cultivators, picks, forks, &c., to be repaired; and hinges for gates and out-houses, latches, tug-chains, hooks, iron-work for buildings, carts, &c., to be made and repaired. All of this work may be profitably and successfully done, if one is possessed of the knowledge of a few elementary principles concerning forging, filing, drilling, and sawing iron.

I know of at least one farmer residing in the irrigated areas who sent two of his sons to a metropolitan blacksmithing class—one for two years and the other for one year. After their return to the farm, during the winter evenings, particularly, they had the forge almost constantly at work,



1. AGRICULTURAL LEVER FORGE.



2. PORTABLE BELLOWS FORGE.

effecting repairs, renewing worn out parts, and making new tools, sharpening and relaying ploughshares, picks, swingle-tree mountings, trace-chains, split links, &c. Every farmer cannot act similarly to the one mentioned, consequently, it would be a decided advantage to build a shop and stock it with the plant requisite to enable him to do blacksmithing work for himself.

The object of these articles is to assist those who may become impressed with the value of the suggestion, and instruct them how to lay out a shop, and how to make simple, but, at the same time, useful articles connected with farm work.

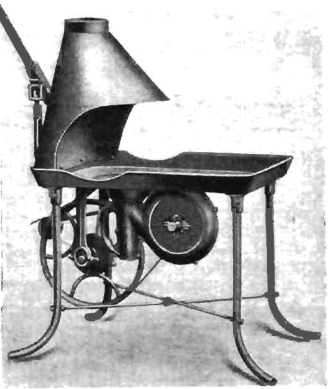
It is not the intention to deal with horse-shoeing, as I consider it impracticable to learn that branch of the trade from written description alone. In fact, it would be unwise for any amateur to practise. Horse-shoeing must be learnt by doing the work under the directions of an expert; one reason is that horses' feet are not all alike, and consequently need to be seen and treated according to requirements.

THE WORKSHOP.

For those who desire to make a start at blacksmithing the first thing to be considered is the workshop. It is not necessary to have an elaborate building for the purpose. A shed 12 ft. square and about the same height, gives ample room for a small forge, anvil, bench and vice, small tools, and material. It may be constructed with slabs or a framework covered with palings or galvanized iron. The roof would be all the better if covered with iron, principally on account of sparks. It is not intended to enter into the details of the workshop construction further than this. I prefer leaving it to the individual to adopt his own methods, and adapt the materials available to his requirements.

The next consideration is the forge. There are several kinds that may be used, the selection depending upon the size of the shop, utility of forge, and price. Forges may be divided under two main headings, namely, portable and fixed. In each case, the fire may be blown either with a pair of bellows, or by a fan driven by hand, or foot power.

Where the space is limited a portable forge is to be recommended. I prefer one driven by a fan which is fixed beneath the hearth and the fan worked by hand. The reasons for choosing the fan in preference to the bellows are: Firstly, that it heats the iron quicker, and secondly, that it lasts longer. The forges illustrated are stocked by nearly all hardware merchants, and vary in size and shape.



3. PORTABLE FAN-DRIVEN FORGE WITH RECTANGULAR HEARTH.

No. 1 is a forge specially made for agricultural work. It stands about 30 ins. from the floor and the diameter of the hearth measures 18 ins. Cost, about £2 5s.

No. 2 is a bellows forge of about the same size as No. 1. The price varies according to size.

No. 3 is a forge with a rectangular hearth. It is larger and better than the others shown; the cost is necessarily greater, being about £8.

Whilst the bellows are more common in the case of the fixed forge, the fan is more powerful. Bellows cost from £1 2s. 6d. upwards. If it is decided to adopt the bellows, one measuring 24 ins. and costing about £1 13s. would be the most convenient size. A fan would cost from £3 upwards, but it would last longer and give a stronger blast.

In the fixed forge, the hearth can be built of bricks, stones, hardwood, or iron. An old square or round tank makes a splendid forge. In any

case, the structure is filled with earth, with the exception of a hole left in front of the "tue-iron" for the fuel.

The "tue-iron" is either a cast or wrought iron nozzle inserted through a hole in the forge and projecting about 8 ins. Its use is to convey the blast from the bellows or fan to the fire. The cast-iron ones are solid, whilst those wrought are hollow, and are filled with water to prevent burning away. Cast ones cost 4s. 6d. each, and the wrought-iron ones 15s. Although there is a large difference between the prices, I prefer the water "tue-iron," because it will last out many cast ones and be cheaper in the end.

The anvil is the next important consideration. Purchases are made according to weight, the price being about £2 per cwt. Nothing lighter than 1 cwt. should be used—about 1½ cwt. is a very convenient size.

In the next article it is proposed to deal at greater length with the details of fitting up the shop; illustrations showing the general arrangement will also be furnished.

(To be continued.)

PROPAGATION OF FRUIT TREES.

(Continued from page 371.)

C. F. Cole, Inspector, Vegetation Diseases Acts.

STOCKS (*Continued*).

CHERRY.

There are three varieties of cherries used as stocks for propagating purposes in Victoria, viz., Mazzard Seedling, Perfumed Cherry (*Cerasus mahaleb*), and the old well-known so-called Kentish Sucker. Undoubtedly the latter variety is the most suitable as a stock for the general cultivation of the many varieties of cherries grown in this State. Besides being hardy and suiting different soils where the cherry flourishes, trees grow to a nice convenient size, crop early and well, and mature good fruit. Many varieties, like Early Purple Guigne, Bigarreau Napoleon, and St. Margaret, are not so liable to gum as when worked upon the Mazzard Seedling.

For producing well grown and attractive young trees in the nursery beds, the Mazzard Seedling is hard to surpass. Therefore, it is a general favourite with propagators.

The *Cerasus mahaleb* is very little used as a general stock, as it has a strong tendency to dwarf the variety worked upon it. Trees for the first year or so make good average growth upon this stock, but after this the dwarfing influence is noticeable.

One bad feature with the Kentish stock is its suckering from the roots. This can be minimized to a large extent during cultivation by taking care not to cut or injure the surface roots. Suckers should not be chopped off shallow beneath the soil; if so, they will throw up numerous others. The soil should be carefully removed, exposing the roots responsible for suckering. Cut away and pare with a knife at the junction of sucker and root; then replace the soil.

If propagating the cherry upon undrained soil, select a site in the nursery where the soil is loose and friable, or one that the water can readily percolate through, and be quickly got away by open drains. In badly drained soil, the roots of the cherry readily decay.

PLUM.

The Myrobalan and Mariana, belonging to the Cherry Plum variety and already mentioned in this article, are now used for propagating the many varieties of plums. Most of the Japanese varieties thrive well when worked upon them.

I consider Mariana the most valuable stock we have so far in general use. Easily rooted, like Myrobalan, from cuttings, it resists wet or undrained soil better than the Myrobalan. Trees are not so apt to die out suddenly when worked upon it, and many varieties that are shy bearers upon the Myrobalan are prolific upon this stock. On page 344 is reproduced a photograph of an area of Mariana stocks from cuttings, ready for budding.

Although some varieties, like Angelina Burdett and Cole's Blue Superb somewhat over-grow this stock (Mariana) it is no great fault but an improvement—it influences the bearing qualities of varieties so inclined to over-grow. The somewhat slower growth of the stock retards that of the variety worked upon it. It is not generally known that thousands of the most productive plum trees in this State are worked upon the Mariana, and not upon the Myrobalan as supposed.

The ordinary plum is a species of fruit that makes its full growth generally before the New Year and becomes dormant in early autumn. Although the top influences the stock, that of the stock upon the top is much greater. When propagating fruit trees for general purposes, a stock whose habits coincide with those of the species to be worked, especially with regard to the vegetative period, should be used. After heavy rains in the autumn, plum trees are not so apt to start fresh growth or break into bloom when worked upon the Mariana, whereas the vegetative period of the Myrobalan is prolonged well into late autumn and is very responsive to late rains, especially after a dry spell. The writer attributes the sudden dying out of trees when worked upon this variety chiefly to the exhaustive nature of the stock.

In soils and localities where the peach thrives, the seedling peach is a valuable stock for many varieties of the Japanese plums, such as Wickson, Burbank, Kelsey, etc. Most of the varieties similar in constitution and appearance in growth, etc., to those mentioned, are suitable for working upon the peach stock. Varieties having hard wood and very smooth bark are most suited for the plum stock, for example, Hale, October, Purple, etc.

When budding cherry plums or damsons, select small healthy stocks, and not large vigorous ones. When making cuttings, see that they are cut straight and about 12 in. in length (Fig. 16). As plum cuttings callus from the cambium exposed by the freshly made cut and very seldom root from the buds before striking root from the callus, it is not necessary to cut at an apex bud. A pair of sharp secateurs may be used for making the cuttings, care being taken to see that they cut cleanly. The matter that corrodes upon the inside of the blade when in use should be kept scraped off, otherwise they will not do good work.

Cuttings, when made, should be well heeled in or planted out at once. If left heeled in too long and having callused, it will be necessary to plant them the same way as rooted stocks, *i.e.*, by opening out a grip, and plant-

ing about 6 in. deep. Cuttings should be planted early in June. On no account allow them to suffer from the want of water in October, November, or December, or any time previous to the hardening of the roots.

If striking the cuttings in beds for replanting the following winter, make a grip and plant the cuttings thickly—about 1 inch apart. Do not over-water to encourage strong rapid growth. The soil should not be enriched. The aim of the propagator is to secure well rooted stocks with moderately thick stems.

Thin cuttings from matured wood—up to the size of an ordinary lead pencil—should be selected. The beds for striking cuttings should be ploughed no deeper than 6 in., the rows being far enough apart to allow the cultivator to pass through. The soil should, if possible, be light, well drained, and have a warm subsoil. If the bottom of the soil becomes water-logged and cold the callus or callusing parts will decay and the cuttings die out.

Undoubtedly, under most conditions, the better method is to raise stock in seed beds, then lift, and transplant. By following this system the stocks can be graded before planting out and uniformity maintained in the rows. The other system of planting out cuttings, etc., directly for working upon is quicker; but, if an irregular strike takes place, it means the tilling and loss of a portion of the land that could be put to other use.

The plum thrives best in heavy loams, or light soils having a clay subsoil, well drained.

Medlar.

This peculiar fruit is easily propagated by grafting or budding, using the quince as a stock. It thrives well in soils where the quince flourishes, but prefers a sheltered position.

Japanese Persimmon or Date Plum.

This luscious fruit is propagated chiefly by grafting upon a small fruiting variety raised from seed. Pips can be saved from any seeding variety and the stocks used for working upon.

Pips may be sown in June, July, and August, in beds. The young seedlings should be sheltered from the hot sun in late spring and early summer. Small leafy boughs, selected from some shrub or tree that holds its leaves well when dry, answer this purpose. When cutting twigs, leave the stem long enough so as to hold firmly when pressed into the soil. Do not let the seedlings suffer from the want of water.

Seedling stocks can be imported directly from Japan. The stocks can be bench grafted (whip-tongue method) or planted out permanently in deep, loose and well drained soil. When well established, graft low down (ground level) when the sap begins to move in the stocks. Select scions from well matured past season's growth. Cover the union well when binding and mould up with earth, patting well with the hands to expel and keep out the air. Care should be taken when performing this operation not to knock or displace the scion. A good plan is to bind the union with calico dressed lightly with grafting wax.

The warm and irrigable districts of the State are more suited than the cool for propagating this fruit. Most of the worked trees sold in Victoria are imported from New South Wales.

The persimmon, once established, is hardy and does well in most districts. It likes a deep loose loam or sandy soil well drained, and water during the summer months. Seed saved from select varieties come fairly true, and produce good fruit. The trees take longer to come into bearing than worked ones.

LOQUAT

This fruit can be propagated from seed, or by budding and grafting. The seed should be sown in drills 1½ in. in depth and covered with light soil or sand. The following winter the seedlings may be planted out permanently. Seed saved from choice varieties only should be sown. Trees raised from seedlings take many years before they become productive. Sow seed in May, June, July, or August.

By using the quince as a stock for propagating upon the loquat is brought into bearing much earlier. The writer's advice to those growing for profit is to plant the loquat worked upon the quince. Quince stocks should be field grafted at ground level (whip-tongue method). Select well matured scions, bind well with raffia, and mould the graft with soil. Grafting should be performed when the sap is starting to rise in the quince stocks, in early spring.

The loquat tree is ornamental as well as fruit producing. In the drier districts of the State it requires judicious irrigation during the development of the fruit to grow it to perfection. It thrives well in almost any free natural or artificially drained soil.

MULBERRY.

The stock used for propagating the Black Mulberry (*Morus nigra*) upon, by *budding and grafting*, is the White Mulberry (*M. alba*). The latter variety is easily propagated from seed or by cuttings.

The seed should be sown in a bed after the soil has been reduced to a very fine state. Cover the seed lightly with sieved mould or light soil, and keep the beds sheltered from the weather until the seedlings are strong. Sprinkle the beds with a watering can having a fine rose. Seed can be imported direct from France or Germany, or through seedsmen, and should be sown in October and November.

The following winter the seedlings ought to be strong enough to lift from the beds; then trim and plant out for working upon. When *making cuttings*, *well matured straight growths should be chosen (about* 1 ft.), the lower end being cut just below a bud and straight across. Use a sharp knife. As cuttings shoot freely they should be planted out permanently where they are to remain for working upon. Plant cuttings in June, July, or August.

Rooted stocks may be bench grafted. The most popular method is to work the scions of the black variety directly upon the root of the white variety (whip-tongue or insertion method). Secure the roots by digging up stock trees of the latter variety. When re-planting stock trees cut the growths hard back. Keep well watered during the dry summer months. *Root graft in August. Field graft when the sap is rising.*

Attempting to propagate the mulberry in the cooler districts of the State is very unsatisfactory; only a very low percentage of the buds and grafts will take. In the warm and irrigable districts the Black Mulberry would pay well to propagate up to a limited quantity. Good trees in nursery stock always find a ready sale at remunerative rates.

If possible, plant in deep loose soil, and water well during the hot weather. If given proper culture, the young trees ought to be saleable the winter following budding or grafting. Do not check the growth by topping in the hope of getting them to branch.

FIG.

The fig may be propagated from cuttings, layers, stools, or grafting. When making cuttings, well matured past season's growths should be

selected and cut, leaving a heel at the apex end of the cuttings, *i.e.*, a small portion of the older wood.

Cuttings should be about 12 ins. in length and cut with a sharp knife just below an apex bud. Plant down half their length in the soil and upon a firm bottom. By placing a little sharp sand at the bottom of the cut before planting, better results will be obtained. But it should be understood that figs do not strike readily from cuttings planted out in the open, but successfully in heat.

As figs sucker and root freely from layers the best method to propagate is by stooling or layering them similarly to the Northern Spy apple. (See page 367). Sharp sand or very sandy soil should be used for moulding purposes.

When grafting, select well matured wood for scions. The better varieties may be grafted upon suckers from the commoner kinds (bench or field grafted). Root grafting, the same as apple stocks, may be practised with fairly good results. Select clean healthy roots. Graft in August and early September.

The fig thrives best in a well drained deep loose soil, and should be well supplied with water during the dry season.

(*To be continued.*)

ORCHARD AND GARDEN NOTES.

E. E. Pescott, Principal, School of Horticulture, Burnley.

The Orchard.

DRAINAGE.

The continuous rains of the early winter have, in many cases, shown the necessity for draining orchards. Where under-soil drains do not exist, the trees are bound to suffer; if the damage is not immediately apparent, it will be later found that in some way loss will accrue. Either the tree will be weakened by loss of roots through rotting; or it will be devitalized so that it will not carry a satisfactory crop of fruit. Too often, surface drainage is relied on to remove the so-called surplus water. There should be no surplus water for surface drains. The water is only surplus or in excess when it is in the soil, and not before it enters the soil. Two circumstances, and two only, permit of surface drainage: first, when it is necessary to carry away excessive storm-water; and, second, when it is practically impossible to find an outlet for the under-drains, owing to the low-lying situation of the area.

The term "surface drainage" does not apply to open drains which, owing to their depth, act also as soil drains; neither does it apply to graded surfaces which allow a more equitable distribution of the water. Surface drainage is usually applied to a system, whereby a considerable quantity of water is removed by gravitation before it enters the soil. Such a system cannot be too roundly condemned. As much water as can possibly be obtained by natural means should be induced to enter orchard soils; and then whatever is in excess will be carried away by under drainage, provided that drainage, either natural or artificial, be in existence.

Where suitable drainage is not provided, the tree roots are compelled to remain in the few inches of surface soil. Their feeding area is thus extremely limited; and when, at any time, rain-water does filter and penetrate through the soil, it carries with it the soluble nitrates and other plant foods, below the reach of the tree roots.

Soil ventilation is only possible with a system of drainage, and air is as necessary to the roots of a tree as it is to the foliage. By the removal of the surplus water and the consequent admission of air into the soil, the soil temperature is rendered far more equable—warmer in winter and spring, and cooler in summer; and such a change must be beneficial to the trees.

Drainage is thus an essential for all orchard lands. Where natural drainage occurs, the orchardist is fortunate; but, whether natural or artificial, a system of drainage will always materially increase the crop of fruit, strengthen the trees, and considerably add to their term of life.

Drainage schemes should be carried out at the present season of the year. In closed drains, such drainage media as cinders, charcoal, stones, brushwood, timber, logs, or tile pipes may be used, but the latter generally give more satisfactory and permanent results; they are also less liable to silting up than any of the other materials.

Drains should be placed into the clay, if this be not too deep; in any case, they should always be below any possible interference from cultivating implements.

PRUNING, SPRAYING, PLANTING.

Pruning should now be well advanced, on the lines laid down in last month's orchard notes. All prunings should be burned as soon as possible.

Spraying for scales, mites, and aphis should not be neglected, one of the usual oil emulsions being used for the purpose.

Deciduous fruit trees may now be planted, following the instructions given last month. Preparation may now be made for planting citrus trees in the spring.

Vegetable Garden.

Seedlings from the boxes or seed plots may be now planted out. Care should be taken that all vegetable beds are well raised and thrown up. By throwing up the soil, and thus deepening the paths and the spaces between the plots, the latter are well drained, and the soil is made considerably warmer. This will greatly facilitate the growth of the young plants.

Asparagus may be planted; sow seeds of carrots, parsnips, cauliflowers, onions, peas, broad beans, and tomatoes, the latter being forced on in a frame, so as to obtain good plants quickly.

Flower Garden.

Deciduous shrubs and roses may be now planted out; their situations should be well drained, and all manure should be well incorporated with the soil.

All shrubs that produce flowers on their new young growths, including roses, should now be pruned. Care should be taken to distinguish between those shrubs that flower on the new wood, and those that flower on the wood of past season's growth. Those that flower on the new wood, and may be pruned now, are Lasiandra, Lantana, Cestrum, Hydrangea, Tecoma, Plumbago, Erythrina (some species), &c.; while those that should not be touched at present are Spiræa, Erythrina (some species), *Pyrus Japonica*, Weigelia, *Prunus pissardi*, *P. mumi*, Deutzia, Ceanothus, Polygala, &c. It is a safe rule, in pruning shrubs, to wait until they have flowered before

pruning. This will certainly give the shrubs a somewhat ragged and untidy appearance in the winter, but it is the only way to secure the best flowering results.

All herbaceous plants such as Salvia, Aster, Delphinium, Polygonum, Boltonia, Gaura, and Chrysanthemum should be cut back; and, if necessary, lifted and heeled in a temporary location for the winter.

Plant out Gladioli, Iris, and Liliums.

Continue digging, manuring, and trenching.

THE VALUE OF MILK RECORDS.

J. S. McFadzean, Senior Dairy Supervisor.

The system of keeping records of the milk yield of each cow in the dairy herd, in order that inferior milking stock may be culled out, is gradually gaining favour with dairymen throughout the State; and those following it are unanimous in their opinion of its value. A letter is to hand from a breeder of Holstein cattle, whose milking herd runs well over 150 head. In referring to his records, which have been for years past estimated from one day's milking per cow per month, he says that he is now taking records weekly, and intends to continue on this method for the future. This is sufficient to show that the work is proving highly satisfactory to him.

Some interesting figures have also been received from Mr. F. J. Stansmore, of "Yalart," Pomborneit, in connexion with the recording of the work of each of his cows during the past year.

Out of a total of 141 head:—

19	cows	gave	approximately	300	gallons	each in	12 months
9	"	"	"	350	"	"	"
10	"	"	"	400	"	"	"
16	"	"	"	450	"	"	"
10	"	"	"	500	"	"	"
21	"	"	"	550	"	"	"
29	"	"	"	600	"	"	"
11	"	"	"	650	"	"	"
6	"	"	"	700	"	"	"
7	"	"	"	750	"	"	"
2	"	"	"	800	"	"	"
1	"	"	"	900	"	"	"

As showing the wide variation in milk production that does occur among dairy cows these figures are worth studying by every dairy farmer; but, to the owner of the herd, they are of highest importance. Through keeping tally of each cow's milk for one year, he is now in a position to cull out many which show little profit over the cost of handling them. He can thus reduce his working expenses, and proportionately increase his average return per cow.

The total amount of milk delivered at the factory from the 141 cows during the year was a trifle over 76,000 gallons; or an average of 539 gallons per cow. For a large herd, this is a very fair return, and it is probably fully 150 gallons over the average yield for the State.

The factory milk tests show that only in one month—June—was the butter-fat percentage down to 3.8, the average for the year being a fraction over 4 per cent.

Where labour is hired, the combined cost of grazing and handling a milking herd cannot be set down at less than £5 10s. per cow a year.

Allowing 10d. per lb. for butter fat the year through, and 1d. per gallon for skim milk for pig fattening, there are in this herd:—

19 cows which profit only	£0 12 6	per cow	per annum.
9 ,,	,,	1 12 11	,,	,,
10 ,,	,,	2 13 4	,,	,,
16 ,,	,,	3 13 9	,,	,,
10 ,,	,,	4 14 2	,,	,,

If each lot of cows averaging below 500 gallons were culled out, beginning with those at 300 gallons, note the possible increase in gallons and profit per cow for the herd:—

	No. of Cows.	Gallons.	Profit per Cow per annum.
Present herd	141	539	£5 10 0
Less 19 cows at 300 gall.	122	552	5 15 5
Less 9 cows at 350 gall.	113	568	6 2 0
Less 10 cows at 400 gall.	103	585	6 8 11
Less 16 cows at 450 gall.	87	609	6 18 9

The minimum profit at which a dairy farmer can afford to work his cows is a matter for each to compute, according to his acreage and the labour he has to employ. There are many dairymen at present trying to make a living from cows that do not average more than 300 gallons a year. They do not cull; and, when they say there is no profit in cows, they are, under their system of working, coming close to the truth.

But there are very many others who have carried on their dairying in a thorough business manner. They cull out all cows that do not show a reasonable profit over working expenses; and these are the dairy farmers who have no complaint to make against the milking cow.

Included in Mr. Stansmore's herd are several pedigreed Ayrshire and Shorthorn cattle. These are typical dairy stock; and, having come successfully through the test of profitable milk production, each will from now on have a more definite and much enhanced value for breeding purposes.

FIELD EXPERIMENTS AT THE ROTHAMSTED EXPERIMENTAL STATION, 1910.

(Extracted from the Annual Report for 1910 of the Rothamsted Experimental Station, Harpenden, England.)

T. A. J. Smith, Chief Field Officer.

From the above Report can be gleaned some useful information which applies to Victorian soils more or less, according to the prevailing climatic conditions in various parts of the State.

Phosphatic Fertilizers.—The season was an exceptionally wet one, and one result in connexion with the use of phosphatic fertilizers was emphasized in a marked degree, viz.: that phosphoric acid has its maximum effect in wet and cold seasons. Plots unmanured with phosphoric acid fell to a very low level, while those treated with phosphatic fertilizers gave the best results.

Lime.—The effect of lime on the plots was not so marked as usual, though its value was very apparent where the soil had become soured

through the application of ammonium salts. Also, on the limed plots, where peat had accumulated, the effect was a close sward of grass and the disappearance of the peat.

Nitrogenous fertilizers.—New nitrogenous fertilizers were further experimented with, the results, however, being disappointing. Nitrate of lime and cyanide gave poor returns, while nitrate of soda was the most effective source of nitrogen applied.

Nitrate supplies.—The conclusion adopted was that, under field conditions, the factor limiting the formation of nitrates is really the preliminary ammonia-producing process, and instead of the rate of nitrification, it is the rate of ammonia production which determines the amount of nitrogen available for the crop.

Dressings of farmyard manure gave better returns than any of the artificial fertilizers.

Rotation cropping.—An experiment in connexion with rotation cropping gave most useful information in regard to the preparation of the soil for wheat, and bears special significance to soils that require building up in humus and nitrogen. After the growth of vetches the yield of wheat was best, and after leguminous crops generally, such as crimson clover and vetches, was 60 per cent. better than after rape or mustard. It was also noticeable that on all the plots following green manuring, there was an absence of the blight which characterized the wheat elsewhere.

The yield of straw was even more favourable than the grain, after clover and vetches, and was due, in all probability, to the storage of nitrogen in the soil by these crops and the supply of humus in the shape of decomposing roots, &c., This knowledge should be especially useful to Victorian farmers in showing how humus and nitrogen can be supplied in our soils as a partial substitute for farm manure which cannot be secured in sufficient quantities in this country for our wheat areas.

The accompanying table gives the actual returns:—

Green Crop.	Yield of Wheat.	Straw.	Total Produce.
	bushels.	cwts.	lbs.
Mustard	19·6	15·3	2994
Rape	20·8	16·3	3188
Crimson Clover ...	30·8	27·0	5037
Vetches	34·4	34·7	6162

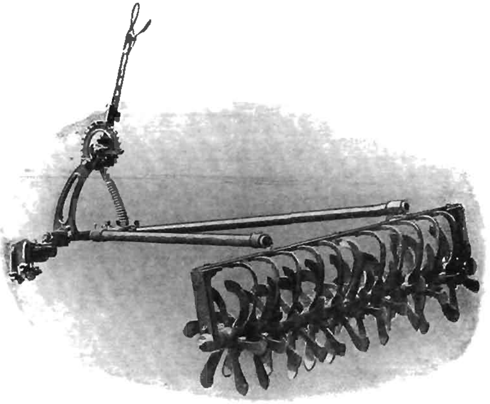
Other experiments such as "Clover sickness" and "The effects of heating and of antiseptics on the fertility of the soil" have been continued but have not yet reached the stage for report.

THE KRAMER HARROW ATTACHMENT.

A. S. Kenyon, C.E., Engineer for Agriculture.

The Kramer rotary harrow attachment for multiple furrow ploughs was first imported by the Department of Agriculture in 1909. It was sent for trial to Mr. G. H. Adcock, Principal, Rutherglen Viticultural College, who reports as follows:—

I confess that when it was opened, I was sceptical, but having had it at work nearly two years I am highly pleased with it. It saves a considerable amount of labour and horse-power, enables us to "catch the ground" at the right time, and does its work very thoroughly. As it was the first seen in this district it aroused considerable curiosity and several farmers came to see it at work and were quite enthusiastic over its merits. I believe that, from seeing ours, several farmers have obtained this implement and are equally pleased.



KRAMER ROTARY HARROW ATTACHMENT.

The main use of the attachment is where it is desired to harrow the ground immediately after ploughing. It then means a great saving in draught, as compared with an extra team pulling the ordinary harrows; the attaching of harrows to the plough itself is frequently troublesome and difficult to accomplish satisfactorily. In fallowing in dry seasons, the immediate stirring of the surface is essential to prevent loss of moisture. This attachment excellently serves such a purpose.

Mr. J. G. Black, Melbourne, imported the Departmental implement, and is now the agent for the manufacturers, the Kramer Company, Paxton, Illinois, United States of America.

SILO CONSTRUCTION.

A. S. Kenyon, C.E., Engineer for Agriculture.

In the *Journal* for October, 1909, were given full instructions for the erection of the wood and iron silo. At that time the Department had discontinued the erection of silos for farmers. Since then, the demand for the resumption of the building policy has been continuous, and the Department is now prepared to build silos of the types described hereunder, or to assist in the erection of any other approved type.

As before, inquiry by a dairy supervisor as to the *bona fides* of the applicant, as to his need for such a method of conserving fodder, his capability for growing the necessary crop, and the likelihood of the use of the silo being successful, and thus forming an object lesson to the district, precedes the granting of the application, whether terms be desired or cash offered. The supervisor will, at the same time, advise as to the best location of silo, method of using, class of crops to grow, necessary machinery, and other matters.

Too much stress cannot be laid upon the absolute necessity of following out in every detail the instructions given *re* filling. Success can only be thus achieved. The points included in the instructions have all been carefully thought out, and are the results of practical experience under all sorts of conditions. Not, be it understood, that anything like perfection has been reached. Many suggestions made by correspondents have been examined and adopted. More will be welcomed.

Lime washing is absolutely essential with the iron-lined silos, and is nearly as much so with the concrete ones. Make the lime-wash thick and give a coat as the silo is emptied, as well as one when filling.

WOOD AND IRON SILO.

The chief alterations are the omission of the soles and struts in the foundation posts. Split posts, which are now to be supplied by the farmer, will serve if one face be trued up square for the part above the ground. The top sprocket wheel in the elevator is replaced by an iron pulley, and the running speed is increased about 23 per cent.

Directions for Building a 69-ton Silo.

(14 ft. 8 in. inside diameter, and 21 ft. high.)

All materials used should be of approved quality and the best of their kind. The timber is to be specially free from knots and gum veins.

Foundation.—Roughly level site for a diameter of 16 ft., making provision if on slope for drains to carry off any flow of water. Prepare eight foundation posts of 6-in. x 4-in. red-gum or other sound and durable timber, 6 ft. in length. Round timber roughly dressed may be substituted for the red-gum, but care must be taken to have the inner face dressed truly. In this case it is probable that longer bolts will be required. Fix a peg in the centre of the sites selected for silo, and describe a circle with a trammel 7 ft. 8 in. in length. Sink posts 2 ft. 9 in. in the ground so that the inside face of each post is true to the end of the trammel. Keep tops of posts to one level and faces truly perpendicular. Well ram the earth put back. From the centre line of face post to the same line in the next post is 5 ft. 10½ in. measured straight. Put posts in to suit line of roof ridge, which should suit position of chaff or silage cutter and elevator. The elevator should go in at top of silo in line with the ridge.

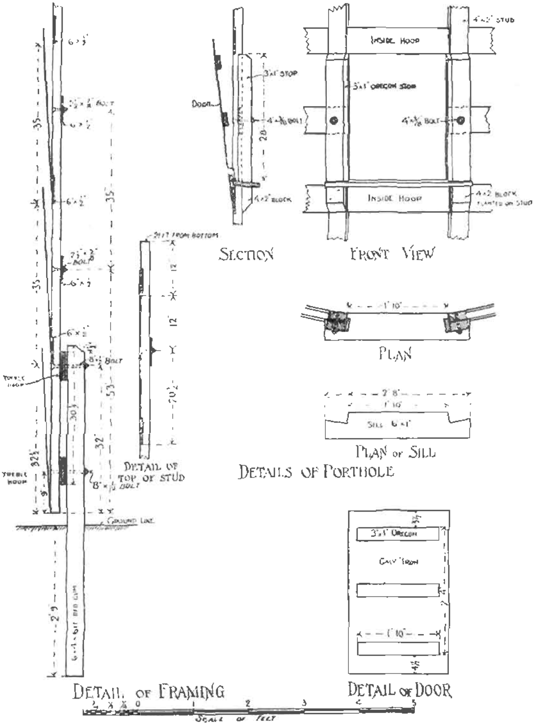
TREBLE HOOPS.—Nail three of the 6-in. x ½-in. boards to the inside of the posts, carefully springing the first of them to the circle of the trammel, off which half-an-inch, the thickness of the board, must first be cut. Make butt joints and let each successive hoop break joints. Keep the bottom edge of the first treble hoop 30½ in. from the top of the post, which will leave it 8½ in. above the surface of the ground. A similar treble hoop is fixed so that its upper edge is 1½ in. below the top of the post. In fixing the upper treble hoop, the trammel, to which a lengthening piece has been nailed, should be used on the slant to insure a correct circle. *These two treble hoops are used to fix studs in upright position.*

STUDS AND SINGLE HOOPS.—First bore and check studs as shown *in drawing. The 32 studs (6/24-ft. and 26/21-ft.—4-in. x 2-in. hardwood)* are to be bored for bolts (⅜-in. bolts) and countersunk ½ in. deep, 1 in. diameter clear, for heads of bolts. The centre of first hole is to be 9 in. from the bottom of stud, the second 32 in., the third 53 in., and thence at intervals of 35 in., the ninth and last being 19 ft. All studs are to be checked out 6 in. wide and ½ in. deep on the same side as the countersinking; from bottom of stud to bottom of first check 32½ in.; and from bottom of first to bottom of second 35 in., and so on to the sixth check 17 ft. 3½ in. from the bottom. The seventh and last check is 20 ft. exactly from the bottom of the stud.

102-TON WOOD AND IRON SILO.

Before setting up studs decide upon position of port holes; these to the number of three, if the first is in the second row of iron, or four if the first is at ground level, should be vertically above one another, and should be so located as to make the transport of silage to the feeding place as easy as possible. The first stud to be erected should form one side of the row of port holes. The port holes need not be in line with ridge. They may be at any part of the silo. The studs are fixed to the hoops on the flat, every fourth one coming opposite a foundation post, to which they are bolted with two 8-in. x ½-in. bolts passing right through the studs, treble hoops and posts. The intermediate studs are bolted to the treble hoops with 3½-in. x ⅜-in. bolts. The bolts are all inserted from the inside, keeping the nuts on the outside for access when screwing up later on. The spaces between the studs, except at the port holes, should be 13½ in. clear measured between the inside edges of the studs, but are generally a little more depending upon the actual dimensions of the studs. To allow for this, cut a template 13⅜ in. long, using it as a gauge to correctly space the studs. Drive a 4-in. nail 3 in. above the centre of the third hole from the bottom of the stud. When erecting stud, let it rest on this nail on top edge of upper treble hoop; then nail

stud to treble hoops with one 3-in. nail at each. These will hold stud until ready to bore for bolts. It is well to try every fourth stud with a sheet of iron to see that lap comes correctly. Following these directions, the whole 32 studs are erected, the last, however, being put up



DETAILS OF FRAMING, PORT HOLE, AND DOOR.

32 in. distant from the first instead of $13\frac{3}{8}$ in.; this is to leave space for the port holes. The distance between the last stud and the last but one will be less than $13\frac{3}{8}$ in. For the purposes of the roof,

put two 24-ft. studs opposite one another and attach to foundation posts. Place the four other 24-ft. studs at third stud position each side of these two.

The next operation is the putting on of the single hoops. These are alternately on the outside and inside of the studs, the inside hoops taking the horizontal lap of the sheets of iron forming the lining and falling into the checks made as already described. Mark the outside hoops for positions of studs before putting up, by bending them round on top of the upper treble hoop and against the outer faces of the studs. The hoops should be fixed to the same studs as marked. This need not be done for each hoop; every second one will be sufficient. Unless this is done carefully, the silo will most likely have different diameters at different points and trouble will ensue when putting on the lining. The outside hoops should lap over so as to cross two adjacent studs. They are secured at each stud with 2½-in. x ⅜-in. bolts and at laps with 3-in. x ⅜-in. at first stud of the lap and 3½-in. x ⅜-in. at the last one, there being a plate washer 5-in. x 1-in. x 5-16-in., with 7-16-in. hole in centre at the end bolt. The inside hoops are fastened to the studs with two 2-in. nails to each stud. Care should be taken not to have the joints vertically above one another. Nail short pieces of 6-in. x ½-in. for the width of two studs next the port hole and opposite to the inner hoops; these will serve as a ladder for access to the top and the port holes.

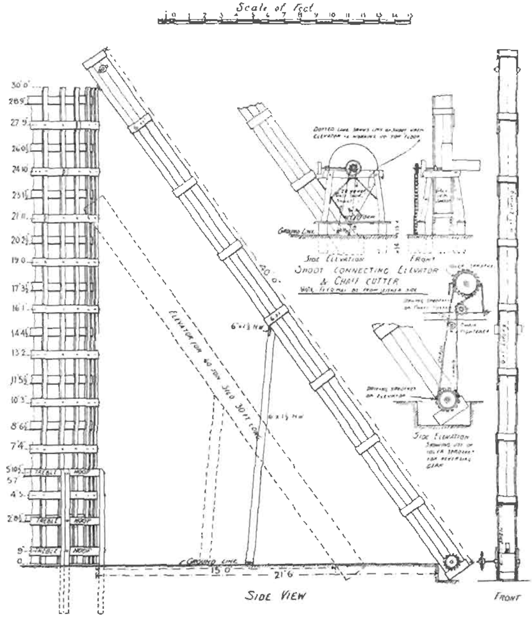
Lining.—6 ft. x 3 ft. galvanized flat iron (24 gauge) is used. If the studs and hoops have been erected as described, the sheets will have a lap of 3 in. vertically on the studs and 1 in. horizontally on the hoops. Carefully press the sheets out to the line of the circle before nailing, and start at the centre studs, working out to the side studs. This will make the iron set better. Tack with 1¼-in. clout tacks on the studs, 3 in. apart at the laps and 6 in. at the other studs. Tack with ¾-in. clouts (two between each stud) to hoops at horizontal laps, putting clouts ¼ in. up and down alternately to avoid splitting hoop. The upper sheet in each lap is put outside the lower to keep the weather out and prevent rain working in. Consequently, this work must be started from the top of silo. Drive two tacks in the hoop below the sheet at its ends to rest the iron on while tacking. These tacks to be drawn when sheet is fixed.

Roof.—Fix two purlins for ridge 20 ft. long to the centre 24-ft. roof studs, the top of studs being checked 1 in. on each side for purlins, and purlins bolted to studs with 6½-in. x ⅜-in. bolts, one to each stud. These purlins to project in order to attach block and tackle. Secure in a similar manner, with 5½-in. x ⅜-in. bolts, purlins to the third studs each side of ridge studs, which are 24 ft. high as directed, and bottom purlins to ordinary length studs—the sixth on each side of ridge studs. The centre purlins are fixed to suit the pitch given by the ridge studs and the excess length cut off. Cover with 9-ft. sheets of 26-gauge corrugated galvanized iron, allowing a lap of one and a half corrugations, with 2½-in. springhead nails at every third corrugation. Fix three lengths of 14-in. galvanized ridging with springhead nails every 2 feet. Fix four 3-in. x 1-in. hardwood battens from studs to ends of bottom purlins for supports.

Port Holes.—Port holes are made in every alternate row of iron, the sill of the first being preferably at the top of the first inside hoop. The sills are made of 6-in. x 1-in. hardwood, as shown in the drawing, fixed to the top of an inside hoop and supported on two short pieces of 4-in. x 2-in. skew-nailed on to outer face of studs. The sides are formed of 4-in. x 2-in. pieces planted on studs, notched for ends

of outside hoop and secured with one 4-in. x ⅜-in. bolt. The stops are 3-in. x 1-in. oregon set 1 in. forward from inside face. The doors are made from the piece of sheet iron cut for the port hole, backed with three pieces of 3-in. x 1-in. oregon, 22 in. long, to fit close to the stops. They are held in position by the pressure of the silage.

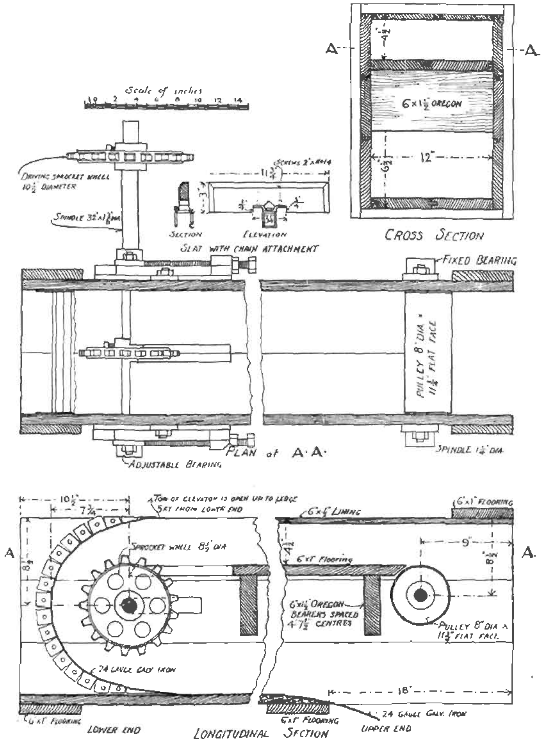
Elevator.—The length of the elevator will vary with the local conditions, whether the ground is sloping, whether the cutter is mounted on a stage, and so on. In general, the length necessary is about 30 ft.



ELEVATOR FOR 102-TON SILO.

A box having sides made of three 6-in. x 1-in. tongued and grooved flooring boards with top and bottom floors of two similar boards, with a cover of 6-in. x ½-in. lining boards, is all that is required. This cover should be fixed in 6-ft. sections to allow of easy removal should it be necessary to get at the chain. The sides and bottom floor are secured by ledges of 6-in. x 1-in. flooring about 4 ft. 6 in. apart. The upper floor is supported on 6-in. x 1½-in. oregon bearers spaced about 4 ft. 6 in. apart. The ground must be excavated to a sufficient depth under the chaff-cutter

to allow the end of the elevator to come directly beneath the chaff-cutter, or the latter may be raised on a platform for this purpose or both may be done as shown in drawing. The end of elevator being put in as far as possible below the chaff-cutter, a chute is made with pieces of sheet iron or of



DETAILS OF ELEVATOR.

wood to connect the cutter, the whole being boxed in as far as practicable. It is essential that this chute should be as steep as possible to prevent the silage from packing up. If the chain be run directly from the cutter sprocket to the elevator sprocket the slats will run

up the top or the bottom floor, according to the side fed from. Looking towards the silo, if the feed be from the right hand, the elevator will work up the bottom floor. It is found in practice better to have the slats running up the top floor, and as the right-hand feed is desirable, throwing the cut stuff into the elevator, a third sprocket is fixed above the cutter, as shown in the drawing, and attached direct to the elevator sprocket. The cutter spindle sprocket drives on one side of the chain. The third sprocket and arm are not included in the material sent out, unless specially ordered. An extra charge of £1 1s. is then made.

The ground end of elevator is rounded off with galvanized sheet iron, allowing just sufficient room for the slats to move round the sprocket wheel when the adjustable bearings are fully extended. The line of this iron will be described with a radius of $7\frac{3}{8}$ in. from centre of sprocket wheel. The cover of elevator is left off as far as the first ledge, about 5 ft. from the ground end. The bottom floor of silo end of elevator is cut back 18 in. and provided with a galvanized iron lip; this is to prevent the slats striking against edge of bottom floor when the silage is being carried up on the top floor. The end of elevator is to project into the top of silo 21 in. The top floor of silo is cut back from ground end $11\frac{1}{2}$ in. and the silo end 10 in.; a slot is cut in the floor at the ground end to allow for the working of sprocket wheel. The adjustable bearings are attached to the outside of elevator at ground end with two $2\frac{1}{2}$-in. x $\frac{1}{2}$-in. bolts to each bearing, a $\frac{3}{4}$-in. iron washer being placed between head of bolt and inside of elevator. The bearings are fixed so that the centre of spindle is $8\frac{1}{2}$ in. from top of box and $10\frac{1}{2}$ in. from ground end when the bearings are fully extended. The spindle should be fixed in this position when the elevator is working. The bearings for the pulley at silo end of elevator are fixed so that the centre of the spindle is $8\frac{1}{2}$ in. from top of box and 9 in. from silo end of elevator. The slats or buckets for carrying the silage are of 3-in. x 1-in. oregon chamfered on one side, checked $\frac{3}{4}$ in. deep by $3\frac{1}{4}$ in. wide for the attachments which are fixed to slats with two 2-in. No. 14 screws to each and with a V-shaped cut beneath attachment to allow for insertion of sprockets. The elevator is nailed together with 2-in. nails from the inside, the nails well punched, clinched and then punched again. Great care must be taken that nothing will project inside the elevator which may catch the slats. The elevator is supported in the centre, as shown in drawing, with a T-piece made of a length of 6-in. x $1\frac{1}{2}$-in. hardwood, checked $\frac{1}{2}$ in. at top and well spiked to a piece of 6-in. x $1\frac{1}{2}$-in. hardwood, and fixed at bottom end as shown.

The following is a list of material required for the 69-ton silo specified. Some of the items are slightly in excess, in order to meet contingencies:—

Material for 69-ton Silo.

Red-gum, 6-in. x 4-in.; 8 6-ft., foundation posts.
Hardwood, 4-in. x 2-in.; 6 24-ft., 27 21-ft., 2 20-ft., 4 16-ft., studs and purlins.
Hardwood, 6-in. x $1\frac{1}{2}$-in.; 5 12-ft., scaffolding and elevator support.
Hardwood, 6-in. x 1-in.; 1 12-ft., port hole sills.
Hardwood, 6-in. x $\frac{1}{2}$-in.; 65 18-ft., hoops.
Hardwood, 3-in. x 1-in.; 2 16-ft., supports for bottom purlins.
Oregon, 3-in. x 1-in.; 4 15-ft., port hole doors and stops.
Galvanized iron, plain sheets, 24 gauge; 56 72-in. x 36-in., lining.
Galvanized iron, corrugated sheets, 26 gauge, 16 9-ft., roof.
Galvanized iron, ridging, 26 gauge; 3 lengths 16-in., roof.
Galvanized iron, springhead nails, $2\frac{1}{2}$ in.; 3 lbs., roof.
Wire clouts, 12 lbs. $1\frac{1}{4}$-in., 3 lbs. $\frac{3}{4}$-in.
Bolts, nuts, and washers, 2 $6\frac{1}{2}$-in. x $\frac{3}{8}$-in., ridge purlins and studs.

Bolts, nuts, and washers, 8 5½-in. x ⅜-in., other purlins and studs.
Bolts, nuts, and washers, 8 4-in. x ⅜-in., port holes.
Bolts, nuts, and washers, 80 3½-in. x ⅜-in., treble hoops and studs: lapped hoops, plate washer, and stud.
Bolts, nuts, and washers, 36 3-in. x ⅜-in., lapped hoops
Bolts, nuts, and washers, 200 2½-in. x ⅜-in., outer hoops and studs.
Bolts, nuts, and washers, 16 8-in. x ½-in., treble hoops and foundation posts.
Wire nails, 2 lbs. 4-in., 4 lbs. 3-in., 14 lbs. 2-in.
Plate washers, 24 5-in. x 1-in. 5-16ths-in., with 7-16-in. hole in centre.
Cement, 1 bag.

Material required for 30-ft. Elevator.

White deal, 6-in. x 1-in.; 19 20-ft., sides, floors, and ledges.
White deal, 6-in. x ½-in.; 4 15-ft., cover.
Oregon, 6-in. x 1½-in.; 1 8-ft., bearers.
Chain, 60-feet, 1 9-16ths-in. pitch, with coupler and pin. (No. 45 link.)
30 oregon slats, with attachments for No. 45 link.
1 8-in. diameter sprocket wheel, 16 teeth, with 32-in. spindles, 1½-in. diameter, for No. 45 link.
1 pulley 8-in. diameter x 11¾-in. flat face, with 20-in. spindle 1½-in. in diameter.
2 deadeye bearings.
2 adjustable bearings.
1 22-teeth, 10½-in. diameter, sprocket wheel for No. 52 link.
1 10 teeth, 5-in. diameter, sprocket wheel for No. 52 link.
14-ft. chain, 1½-in. pitch, with coupler and pin (No. 52 link).
8 2½-in. x ½-in. bolts, nuts, and washers.
8 iron ⅜-in. bolt washers.
2 sheets of 72-in. x 36-in. 24-gauge iron.

The cost may be computed from above list. At present prices of material in Melbourne, it would run into £31 10s., of which £8 is for the elevator. With an experienced builder, assisted by three handy men, the whole work of erection, including construction of elevator, should be completed within four or five days. After the silo has been erected some time, and the greenness of the wood considerably lessened, the whole of the woodwork, and, in any case, the lower 3 feet, including both treble hoops, should be painted.

The hoops close to the ground must not be covered with earth; they are an essential portion of the structure, and should not be weakened by rot or white ants. The floor may be the earth levelled off, or a concrete floor may be put in.

A ring of concrete about 12 in. wide at bottom and 6 in. at top, and high enough to meet bottom of iron and studs, will make a good finish and provide a support for bottoms of studs.

DIRECTIONS FOR BUILDING A 102-TON SILO.

A 102-ton silo is similar in most respects to a 69-ton, having the same diameter, but being 30 feet high. The foundation posts are 9-ft. instead of 6-ft., and should be sunk 3 ft. in the ground. In all other respects they are similar to the posts for a 69-ton silo. There are thirty-two 21-ft. studs, six 14-ft. and twenty-six 11-ft. The boring on the 21-ft. studs is the same as for a 69-ton silo, except for the addition a ⅜-in. diameter hole 5 ft. 10½ in. from the bottom of the stud for the third treble hoop. The checks are similar in all respects up to the sixth, except that the bottom of the seventh and last check on the 21-ft. studs is 20 ft. 2½ in. from the bottom of the stud. The 14-ft. and 11-ft. studs are halved for 2 ft. of the length from the bottom, and ⅜-in. diameter holes are bored and countersunk at 2 ft. 11 in., 5 ft. 10 in., and 8 ft. 9 in. from the bottom, and checked similarly to 21-ft. studs at 1 ft. 2½ in., 4 ft. 1½ in., and 7 ft. 0½ in. from bottom of studs to bottom

trammel must be used at an angle which necessitates the trammel being lengthened to bring it within ½ in. of post at a distance of 5 in. from the top of the post.

LINING.—Before setting up the lining for the outside of wall, decide on the position of port holes. These, to the number of four, should be vertically above one another, and so located as to make the transport of silage to the feeding place as easy as possible. The first upright to be erected should form one side of the port holes. The port holes need not be in line with the ridge. They may be at any part of the silo. Erect all the uprights for the outside lining around to within 24 in. of the first one erected. The lining is to be fixed to both treble hoops, one nail being used in the centre of each board for each treble hoop. Knock out one board every 6 ft. to allow for a scaffold, using the hoops to support it. Bend a single hoop round temporarily on the top of treble hoop and cut it to the same circumference as the inside piece of the treble hoop. Mark at spaces left for scaffolding so as to keep the same spaces and the same diameter to the top of the silo. All hoops above the treble are to be double, with joints broken, the inside hoop being butt-jointed and the outside having a lap of 2 ft. bolted with 4-in. x ⅜-in. bolt and plate washer. The double hoops are spaced 2 ft. 1 in. apart.

Lime-wash with a good thick coat the inside of outside lining before putting up the inside lining. Proceed with the inside row of uprights, covering all joints so as to form a 2-in. lap. Only one nail must be used at each hoop. The nail should be driven through the centre of the board. This will minimize the risk of splitting if the timber should shrink.

Remove the scaffolding and fill in the spaces. This will be done from a ladder. The ladder is to be constructed of 3-in. x 1½ in. uprights, with 3-in. x 1-in. treads; and, when building is finished, to be fixed to the outside of silo near the port holes. Fill in between port holes, which should be placed as follows:—The lowest between the top treble hoop and first double hoop, the second between second and third double hoops, the third between the fourth and fifth double hoops, and the fourth between the sixth and seventh double hoops. The doors are made of 4 in. x 1 in., with joints lapping as in the wall. Allow the top and bottom of doors to come in behind the hoops, which will help to keep the doors in position. Stiffen the doors with two 3-in. x 1½-in. cleats on edge cut to curve and well skew-nailed. The doors are held in position by the pressure of the silage.

ROOF.—Bolt, to the inside of wall, ten studs to carry the purlins; the ridge purlins to be located to suit the position of the elevator, and the studs carrying them are to stand 3 ft. above top of wall. The heights of the other studs are regulated by the pitch of roof. The tops of studs are to be checked for and bolted to purlins with ⅜-in. bolts. Allow each end of ridge purlins to project 2 ft. beyond silo wall, in order to attach block and tackle for hoisting elevator to position and material for weighting silage.

Cover purlins with 9-ft. sheets of 26-gauge corrugated iron, allowing a lap of one and a half corrugations. Secure with 2½ in. springhead nails at every third corrugation. Fix three lengths of 16-in. galvanized ridging with springhead nails every 2 ft.

The walls should be supported on a concrete bed composed of one part cement, two parts sand, and four parts gravel. This is to be laid after the completion of the silo, and should be about 12 in. wide at bottom, 6 in. at top, and high enough to meet bottom of wall, to which it will be a finish and a good support.

Material for a 70-ton Silo.

The following is a list of the material required for the 70-ton silo specified :—

Red-gum, 6-in. x 4-in.; 8 6-ft., foundation posts.
Hardwood, 4-in. x 2-in.; 2 20-ft., 8 16-ft., 3 10-ft., purlins, studs, and scaffolding.
Hardwood, 6-in. x 1½-in.; 5 12-ft., scaffolding.
Hardwood, 4-in. x 1-in.; 290 20-ft., lining.
Hardwood, 4-in. x ½-in.; 65 18-ft., hoops.
Hardwood, 3-in. x 1½-in.; 3 20-ft., ladder, uprights, and door cleats.
Hardwood, 3-in. x 1-in.; 2 20-ft., ladder treads.
Galvanized iron, corrugated sheets, 26 gauge; 16 9-ft. sheets, roof
Galvanized iron, ridging, 26 gauge; 3 lengths 16-in., roof.
Galvanized iron springhead nails, 2½-in.; 3 lbs.
Bolts, nuts, and washers, 24 4½-in. x ⅜-in., for lapped hoops.
Bolts, nuts, and washers, 2 6½-in. x ⅜-in., ridge purlins to studs.
Bolts, nuts, and washers, 18 5½-in. x ⅜-in., purlins to studs, and studs to walls.
Bolts, nuts, and washers, 16 8½-in. x ½-in., foundation posts.
Wire nails, 14 lbs. 2-in., 24 lbs. 3-in.
Plate washers, 24 4-in. x 1-in. x 5-16ths-in., with 7-16ths-in. hole in centre.
Whitewash brush, 1.
Cement, 1 bag.

The cost of the above material in Melbourne at present prices is about £18 10s. This does not include elevator material, which will be the same as for the wood and iron silo.

Additional Material for a 106-ton Silo.

The 106-ton size, or any intermediate size, is made similarly, but each upright liner must be in two pieces. As the joints have to be broken, one portion must be longer than the other. For instance, for the 30-ft. height, use 20-ft. and 10-ft. uprights, and not two 15-ft. lengths. The 106-ton silo is made the same diameter as the 70-ton size (15 ft.), but is 30 ft. in height.

The following is the additional material for a 106-ton silo :—

Red-gum, 6-in. x 4-in.; 8 9-ft. (No 6-ft. lengths required.)
Hardwood, 4-in. x 1-in.; 290 10-ft.
Hardwood, 4-in. x ½-in.; 30 18-ft.
Hardwood, 3-in. x 1½-in.; 3 15-ft.
Hardwood, 3-in. x 1-in.; 1 20-ft.
Bolts, nuts, and washers, 12 4½-in. x ⅜-in.
Wire nails, 7 lbs. 2-in., 14 lbs. 3-in.
Plate washers, 12 4-in. x 1-in. x 5-16ths-in., with 7-16ths-in. hole.

The cost of this material, in Melbourne, would be about £7.

ALL STEEL AND CONCRETE SILOS.

Particulars of the all steel and concrete silos will be given in the August issue.

ANSWERS TO CORRESPONDENTS.

The Staff of the Department has been organized to a large extent for the purpose of giving information to farmers. Questions in every branch of agriculture are gladly answered. Write a short letter, giving as full particulars as possible, of your local conditions, and state precisely what it is that you want to know. *All inquiries forwarded to the Editor must be accompanied by the name and address of the writer.* This is very necessary, as sometimes insufficient information is furnished by the inquirer.

Manuring Fig Trees.—J.L. asks what is the best manure to use for fig trees growing in heavy soil.

Answer.—If the trees are growing and thriving well, they do not need manure. A good water supply is necessary, and an occasional mulching with stable manure, above the feeding roots, is desirable. A lime dressing in autumn, at the rate of 5 lbs. or 6 lbs. per tree, is also useful. If chemical manures are required, give about 4 lbs. per tree of the following mixture:—Superphosphate, 1 part; sulphate of potash, 2 parts; nitrate of soda, 2 parts.

Top-dressing Lucerne.—R.H.L. inquires as to the best time to top-dress lucerne plot with stable manure.

Answer.—In the autumn after a cutting. Then harrow the surface well to break any crust that may have formed.

Liming Cultivation Land.—W.F.G. desires information as to best method of liming cultivation land.

Answer.—Procure good agricultural lime, and apply in the autumn at the rate of at least 5 cwt. per acre. Freshly-burnt lime requires about 60 gallons of water to slake a ton. If no spreader is available, place lime in heaps of ½ cwt. at regular distances apart, slake with 1½ gallons of water for each heap; and, when the mass is pulverized, spread. If drill with fertilizer attachment is used for spreading, slake lime in one heap, but be careful to screen the slaked lime before using.

Potato Digging Rates.—H.H.H. wishes to know what is the current price paid to potato diggers.

Answer.—The price varies from 5½d. to 6½d. per standard bag in average crops.

Pitting Potatoes.—N.N. asks whether the sound tubers will be attacked, if, when pitting, a few Irish Blight-affected potatoes are inadvertently put in.

Answer.—When pitting, any potatoes which show the slightest trace of disease should be rejected. If the potatoes are moist the blighted tubers may infect the sound ones, but if thoroughly dried before storing, the risk is minimized. Do not store in bins or large pits.

Sowing Wattle Seed.—H.B.S. desires particulars as to sowing of Cootamundra wattle seed. He also wishes to know how to obtain seed from sugar gum trees.

Answer.—All *Acacia* (wattle) seed can be sown, according to the condition of the soil and whether it has sufficient moisture to germinate, from April to September. If the Cootamundra wattle is intended for planting out in lines, sow in a shallow box, about 3 inches deep, prepared with fine soil having a little sand in it. Steep the seed overnight to soften the hard outer shell, and sow in shallow rills. If many of the seeds are still hard, they can be soaked in hot water or in strong sulphuric acid for 1—3 hours and then well washed before planting. When the plants are 6 to 9 inches high they can be lifted and set out in permanent sites. Collect sugar gum capsules in autumn just before the valves of the fruit begin to open. Spread out the capsules on hessian on the ground so that both the morning and afternoon sun may open the seed. Winnow the chaff off with a fine sieve.

Caponizing Cockerels.—F.R. asks whether, in caponizing cockerels, it is right to operate from both sides or from one side only. Sometimes a windy swelling appears after the operation.

Answer.—Operate from both sides. The swelling is caused through making the incision in the side of the bird, which allows the air to come between the skin and flesh. By making a small incision in the skin, the air will disappear, and is not likely to come again.

Purging.—W.F.G. states that his 7-year-old pony has a very poor appetite, and is frequently badly purged, especially when getting any hard feed. On the best of grass he does not seem to fill himself nor to fatten, although doing very little work.

Answer.—Have the mouth carefully examined first of all, and correct any dental irregularities that may be present. It would then be advisable to give him half a pint of raw linseed oil and two tablespoonfuls of turpentine well mixed. Subsequently, feed him with chaff and crushed oats in which is mixed night and morning a cupful of equal parts of limewater and raw linseed oil. Begin with small allowance of oats first, and gradually increase it to full amount.

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THE CULTIVATION OF SUGAR BEET.

Harry T. Easterby, General Manager, Maffra Beet Sugar Factory.

In view of the general interest now being taken in the growth of sugar beet for the Maffra Factory, it has been thought advisable to devote a small portion of the *Journal* to giving a few particulars as to the preparation of the soil, cultivation, and treatment of this crop. This article, however, has necessarily been very hurriedly thrown together, due to the demands upon the writer's time in other directions, and it is proposed to follow it at a later date by more complete details.

Selection of Site.

In preparing to grow sugar beet, the selection of the land is of very vital importance, and good to rich soils should invariably be chosen. Poor sandy lands that blow or drift, and wet, cold, and late land should be avoided. On the whole, beet appears to thrive best on good warm sandy loams of good depth, and it best follows a cereal crop of some kind.

Preparation of Seed Bed and Sowing.

In order that a good seed bed may be provided, the ground should be cleared of all rubbish, stubble, or stalks, so that the drill may work quite freely. The land should, if possible, be fallowed in late summer or autumn, so that it may remain open for some time to the sweetening influences of the sun and air, and any weeds that germinate can be killed by the subsequent cultivation.

The first ploughing should be followed in late winter by cross-ploughing and subsoiling to a depth of about 14 in. A proper mechanical breaking and mixing of the soil is what is needed, so that the plant food stored up in the ground can be liberated and made available, and that the roots may have liberty to grow deep down in the soil.

If possible, do not allow weeds to get a start before seeding, otherwise the subsequent cultivation of the crop will involve a good deal of labour that might have been spared.

Having got the soil into fine tilth (and a golden rule in all cultural operations is, "Secure tilth before seeding, not after it"), the sowing can take place. Some authorities recommend the use of the roller just prior to seeding; others use fine harrows or a float to get the requisite fineness. On the whole, the roller has been found to work well.

Drilling machines, or "Seeders" as they are termed in America, are usually made to sow from three to five rows at a time, so that a large area can very quickly be seeded. On small plots, however, the Planet Jr. seed drill sowing one row will be found useful and inexpensive. From very long experience in other countries, as well as in Victoria, rows 18-in. apart have been found to give the best results; and, while as much as 20 lbs. of seed per acre are used in America, the Victorian experience is that 12 lbs. per acre will suffice.

The seed may be planted from the middle of August to the end of September and should be drilled about ¾ in. deep in moist weather, and not more than 1 in. deep in dry conditions. The seed usually germinates in from 7 to 14 days, and here it is well to state that only the best quality of seed should be used. The Maffra Factory, through its

DRILLING.

Technical Manager, Mr. G. S. Dyer, is importing fine quality seed this year which will be distributed to growers at cost price. One of the conditions made with growers for the factory is that they shall use the factory seed only. Small quantities of seed will also be made available to those in other parts of the State who wish to grow trial plots.

Cultivation.

Cultivation should be commenced as soon as the beets are just through the ground so as to keep the weeds down. Cultivators with flat sweeps or duck feet have been usually found most effective; as, if the land is in fine tilth, surface cultivation only is needed.

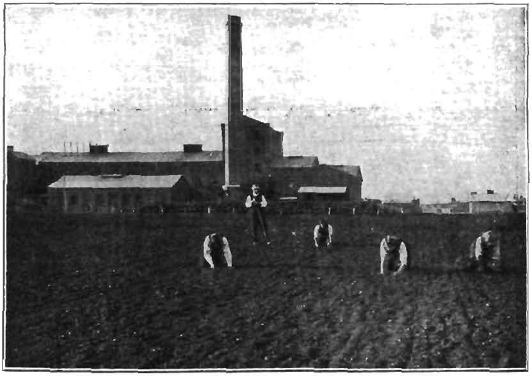
In dry weather, this method of cultivation is strongly to be recommended, as the broad hoes break the fine capillary tubes that are leading moisture to the surface, and leave a mulch of soil which effectively protects the underground moisture during a dry spell. Should showers fall during such a dry period this style of cultivation is very important, for when the top soil is damp, it leads to connexion with the underground moisture and much may be lost by evaporation; but, if the cultivators are

kept going and the soil kept broken on the surface, the moisture will be conserved.

THINNING.

This, without exception, is the most important act in beet root cultivation, for upon it depends the whole after success of the crop. The sooner it can be done the better; but, generally speaking, as soon as the plants are observed to have made four leaves operations should be commenced.

The following is an outline of the process:—With a sharp 4 to 5 in. hoe cut out the young plants so as to leave a 2-in. bunch of beets standing every 4 in. to 5 in. Immediately behind the spacer with the hoe, come the thinners, who should pull out all beets left in the bunch, except the healthiest and strongest plant. This should be done by gently pressing the fingers around the chosen beet while pulling out the others, taking



THINNING BEET CROP AT MAFFRA FACTORY.

care that the roots are pulled out as well as the leaves, otherwise they would grow again. The earth should be carefully but firmly pressed around the plant that is left and any weeds in the row should at the same time be eliminated. The thinner should then pass to the next bunch. Great care should be exercised that no double plants are left. The distance left between the plants should, as nearly as possible, be 8 in., only varying this distance when a stronger or better beet is found at a slightly differing distance.

In practice, this work is quickly done and the above rules are not altogether adhered to, thinners often providing themselves with different shaped knives adapted to cutting out or selecting beets. The spacing with the hoe, however, is a great advantage and makes the work of pulling easier. It also helps to get rid of weeds where these exist. Hand

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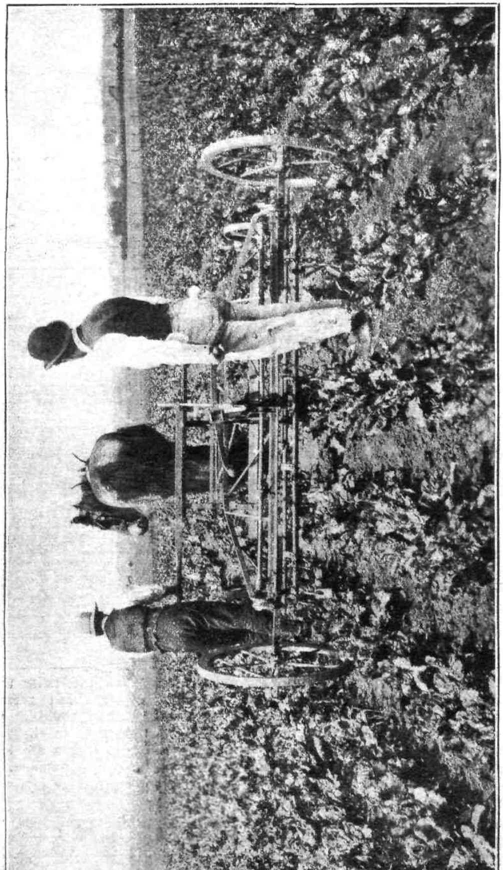


HORSE-HOEING BEET CROP AT MAFFRA.

weeding should be done up to the part of the row where the horse cultivators have gone. A field of thinned beets has a very wilted and woebegone appearance for a day or two and might give a novice the idea that all the beet had been killed. The disturbed plants quickly take hold again; and, if the season is good and cultivation well looked after, it is really surprising the amount of growth that takes place within the few weeks following thinning.

Thinning should be followed by hand hoeing if necessary. As this operation is costly, it should be avoided as much as possible and from three to four horse cultivations given. One good hand hoeing should be sufficient; and, if care has been taken to destroy weeds at the outset, this may be all that is necessary. The horse cultivations are, however, very essential and should be continued at intervals until the crop is ready to lay by; that is, when the horses can no longer get through the crop, except by destroying green leaves.

Harvesting.

Apart from machines specially built for harvesting beet roots—none of which are as yet an unqualified success—the best implement for lifting beet roots is the ordinary "Oliver" or similar plough, deprived of its mould board. This plough runs along the rows with its share under the beet, which it so loosens that they can be easily pulled out by hand and thrown into heaps ready for topping.

Harvesting operation should, as a rule, commence about the beginning of March. The turning of the colour of the leaves from green to yellow is, as a rule, looked upon as a sign of maturity. Chemical analysis of the roots is, however, the best test of ripeness, and this is always resorted to where beets are being sent to a factory.

Topping the beet consists of removing the leaves and collar with one blow from a large knife so that the entire portion upon which leaves have grown shall be cut off. When the ground has been properly subsoiled the roots have plenty of room to grow downwards; but, if shallow ploughing has been done, the roots are forced up by the hard pan beneath and the portion required to be removed is much longer, and consequently the loss is greater from a commercial standpoint.

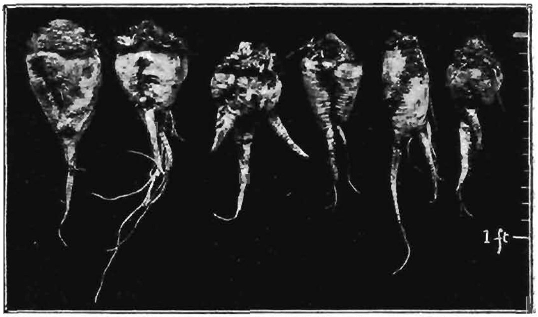
Value as Fodder.

The tops and leaves form excellent fodder, and it is estimated that one ton of tops is equal in feeding value to one ton of hay. Mr. C. Rowley, of Newry, a most successful grower of sugar beet, states that by harvesting two tons of beet per day, topping and carting the roots to the factory, and bringing back the pulp to which he is entitled, the tops and pulp would supply ample feed for 20 dairy cows for three months in the year, provided he was harvesting his beets during that period.

To those who desire to experiment with this crop, but who are at present too far from the factory to sell the roots, we would say go ahead by all means, prove your crop and your district, and if your are successful you can rest assured that a factory will be ultimately erected in your locality. Meantime, you are improving your land and growing one of the very best crops for fattening off pigs and feeding your dairy stock.

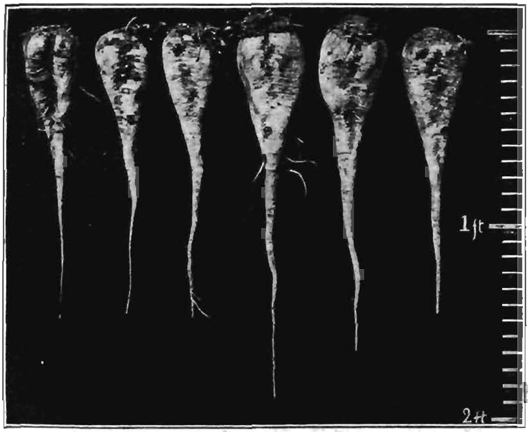
The benefit to the land used for growing sugar beets cannot be overestimated. The soil is opened up and plant foods from lower down are

brought to the surface, while the rootlets which are left in the ground have a considerable humus value. The tops, if not used for feeding, can be



BADLY SHAPED BEET, SHOWING EFFECTS OF SHALLOW CULTIVATION.

ploughed in, and have an excellent manurial effect; and, of course, add largely to the reserve of humus. In ploughing out, the ground practically



PROPERLY SHAPED BEET, SHOWING BENEFITS OF SUBSOILING.

receives another subsoiling which is of incalculable benefit to the succeeding crop.

Growing for the Maffra Factory: Financial Results.

To those who are within a reasonable distance of the Maffra Factory, say up to 80 or 90 miles, we say "Grow beet for the factory; it will pay you handsomely." £1 per ton is to be paid for topped beets delivered at the factory, and from 10 to 20 tons can be grown, according to the character of the soil and the attention given to the cultivation. The Government also undertakes to pay all railway freight over 3s. per ton, so that the growing of beet this year in those districts along the Gippsland line where potatoes proved such a disastrous crop last year should be very profitable. Land that has been under potatoes is likely to be very suitable for beet, and much of it will not need subsoiling.

The following are a few of the results from growers around Maffra and further afield who planted beet last season:—

Mr. B. C. Martin, Tinamba, grew slightly under 3 acres of beet, and paid for every detail at contract rates, allowing 30s. per acre for rent of land. His total expenses were £33 4s. 3d., whilst his receipts amounted to £48, so that he made slightly over £5 per acre, without the value of the pulp, which he received free at the factory.

Mr. T. Vance netted £14 16s. 7d. from one acre of beets after paying 6s. for seed. As Mr. Vance carried out all his own work he is more than pleased and satisfied with the result.

Mr. C. Rowley secured 40 tons of beet from 2 acres at Newry. After paying for seed, thinning, carting, and rent, he came out with a profit of £10 per acre.

Mr. G. C. Johns, of Sale-road, grew 3 acres of beet, and made over £5 per acre nett. A crop of wheat he grew only gave him £4 per acre.

Messrs. French Bros., the largest individual growers in the Maffra district, put in about 18 acres under beet. They paid contract rates for thinning, hoeing, and topping, and were enabled to put £100 in the bank, while their cereal crops are still awaiting sale.

There are many other cases, where returns equal to or exceeding these have been gained.

Conclusion.

What sugar beet growing has done for Europe and the United States it can also do for Victoria. Since the introduction of beet into Germany the productivity of the farms in that country has more than trebled. This is due to the fact that sugar beet is a payable crop which can only be successfully grown by applying to its culture the common-sense rules that govern any profitable industry.

Victoria pays out nearly a million pounds for her sugar. Is there any reason why a large part of, if not all, the sugar consumed in this State should not be made in Victoria, and this large sum diverted into the pockets of our farmers?

Mr. Dyer, the American Beet Expert, now at the Maffra Factory, sums up the growing of beet as follows:—"The beet is one of the best crops to give profitable returns in proportion to the care and attention bestowed upon it. Various important points are: Secure a good stand by using plenty of seed and properly preparing the soil; properly thin when the young beets have reached the proper size, avoid thinning out too far apart in the rows; maintain a good state of cultivation. The secret of raising beets cheaply and of good yield and quality is:—*Keep a clean field.*"

LEAF SCALD OR FRUIT SPOT.

(*Entomosporium maculatum, Lev.*)

D. McAlpine, Vegetable Pathologist.

Although this disease has been known for a considerable time in Europe and America, it has only been discovered in Australia during the present year (1911). Being comparatively common in America, it has been mentioned in connexion with some of the States of the Commonwealth as if it existed here, but its presence has not hitherto been definitely shown.

HEALTHY PEAR TREE.

Towards the end of March, the disease was observed in pears of the varieties Beurré Capiaumont and Williams' Bon Chrêtien, growing in sandy soil about 16 miles from Melbourne. Only a few trees were affected. A number of other varieties growing in the same orchards were quite free. The quince is very subject to this disease; other pip-fruits, such as the apple, and stone-fruits like cherry and peach may also be attacked. It was found for the first time on quince leaves by Inspector Farrell in May, and on the fruit early in June.

Attention was first attracted to this disease by all the leaves of one shoot becoming pale in colour, spotted all over, chiefly on the upper surface, and then falling away early. Then other shoots showed similar symptoms, until the entire tree became involved and its vigour and vitality evidently much impaired. These spots are very definite and distinct, generally circular in outline; at first, of a ruddy colour, then they run into one another and become brownish and ultimately the black slightly projecting fructification of the fungus appears upon them.

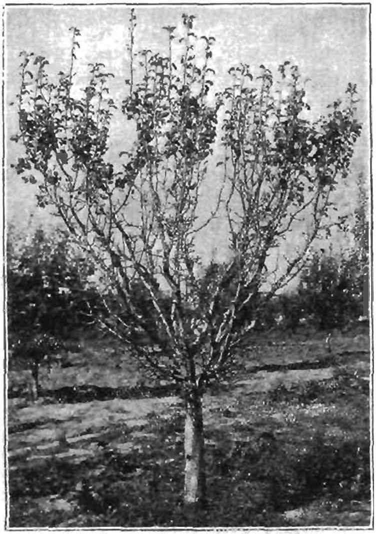
The fruit also becomes spotted, the spots being of a ruddy brown colour. They are the size of pin points to begin with; then they gradually

enlarge to about one-tenth of an inch in diameter, when the black fructifications are scattered over them. They may run together and form extensive blotches like a brown scab; and, in bad cases, the flesh may become cracked, just as in the Pear Scab. The fruit also falls prematurely like the leaves; and, although apparently sound and firm, it soon rots, usually beginning at the stalk end. The grower observed that, on removing the skin, the fruit was not materially injured for use, but the fungus may distort and crack the fruit when severely attacked and render it so unsightly that it does not sell, in addition to rotting quickly.

The disease may also appear on the tips of the young branches; and, by this means, it is continued through the winter, even although the diseased leaves and fruit are removed.

Seedling pears in the nursery suffer seriously from this disease. The youngest leaves are first attacked and fall early, and the young wood is hardened prematurely, so that budding is either prevented or rendered difficult.

The spores have a very characteristic shape and are somewhat beetle-like in appearance, on account of the projecting bristles.

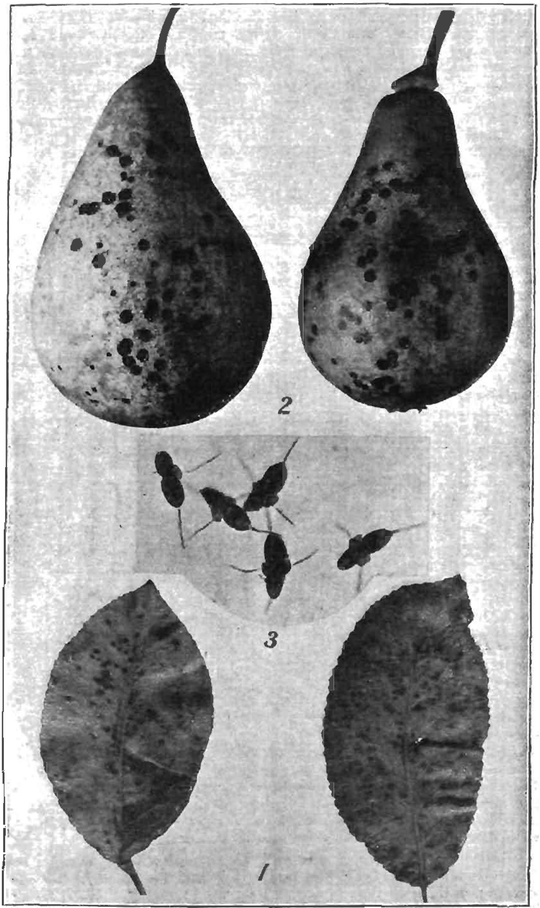


PEAR TREE AFFECTED WITH LEAF SCALD.

TREATMENT.

It is evident that all dead diseased leaves should be collected and burned or at least buried deeply, as well as decaying fruit, in order to prevent the spores infecting the tree next season. Spores placed in a drop of moisture on a young living leaf have produced the minute red spots in about five days; and, in about three weeks, the spores were again reproduced, when the weather was dull and moist. Any shoots showing the disease should also be removed.

Spraying with Bordeaux mixture is also a preventive. Repeated trials in the United States have proved conclusively that this mixture is thoroughly effective, at the same time increasing the size and quality of the fruit. The first application should be made just as for Black Spot, when the blossom-buds have opened and again in about a fortnight.



LEAF SCALD OR FRUIT SPOT.

1. Leaf Scald. 2. Leaf Spot. 3. Spores with projecting bristles.

Since this disease has not as yet become general, a sharp look out for it should be kept in the nursery and orchard and the above measures taken to keep it under control. Now that an export trade is being established for pears, it becomes all the more necessary to check anything which tends to depreciate their value. It must also be remembered that nearly all varieties of pear are found to be subject to this disease, the Duchess and Keiffer's Hybrid being the most resistant of those usually grown.

CITRUS FRUIT CULTURE.

(*Continued from page* 378.)

E. E. Pescott, Principal, Horticultural School, Burnley.

PRUNING.

It is frequently considered that, because orange and lemon trees are evergreen, they do not need pruning. Under this misapprehension they are allowed to grow unhindered, and the result is an upright-growing tree, with an extremely weak leader system, the centre of the tree being a mass of thin, sprawling stems, and the foliage and fruit only on the outside.

Citrus trees require building up from their youth, just the same as any other fruit tree needs training. All evergreen fruiting trees, as well as ornamental flowering shrubs, require a system of pruning for the continual and regular production of new fruiting wood. All side growths must be removed from the young trees to a height of 18 inches or 2 feet, and four or five strong branches should be allowed to develop so as to form a good head of strong-growing limbs. All other strong growths may be cleanly cut out. During the second and following years, the leaders may be cut out wherever suitable side shoots occur so as to continue the leader, either singly or in two divisions.

Thus, in a few years, by a suitable practice of forming and increasing the main growths, keeping all of these out at a fair angle, and allowing no upright growths to become prominent, a good shaped tree will be produced, with strong leaders, capable of carrying a heavy crop without injury to the limbs. In its early stages the tree will usually produce considerable lateral growths; these should not be allowed to produce fruit, neither should they be allowed to gradually become elongated and strong in character. They may always be shortened back to a bud possessing a strong character, or to a weak side growth.

When the tree comes into bearing, the pruning work will be mainly directed towards the management of the lateral growths, and in keeping the tree open. All growths that have served the use for which they were retained should be removed; old fruiting wood, twigs, and growths that have borne fruit must be cut out. It is often noticeable that orange and lemon trees are carrying a great quantity of dead and dying tips, and of long rank growth; these should all be removed. The interior of the tree should be kept well open, so that lateral growths, especially in the lemon, may develop and bear fruit inside the tree as well as outside. The admission of light and air into the interior will also tend to prevent pests and diseases ravaging the tree, and it will thus be correspondingly healthy.

Citrus trees bear their fruit on new wood. In the case of lemons, the fruit is generally carried on the shoots that occur on the laterals; while in the orange there is frequently more fruit on the terminals of the lateral growths. It will, therefore, be necessary, by regular pruning and thinning, to keep up a constant supply of new wood for the production of fruit.

Californian growers have a saying, regarding citrus trees, "All green inside means money to me," referring to the necessity to keep open trees, with foliage and fruit in the interior, as well as on the outside. It will more frequently be found that the best fruit is produced inside the tree.

Citrus trees will live for a considerably longer time, if systematically pruned, than if they are allowed to grow without cutting. Pruning always clears out the old and dead wood, which is a source of weakness; it induces new growths, which impart vigour to the tree; and it spaces the tree for air and light, which always tends to retain good health.

In the case of weak trees of pendant tendencies, the leaders may be cut to buds or growths that incline upwards. Water-shoots will generally need suppressing; they are mostly of a strong upright growth, and if retained they will rob the other parts of the tree of a large quantity of strong, useful sap. A lateral growth from a water-shoot may sometimes be selected to fill in a gap in some vacant part of the tree; the top in that case would be cut right away, changing the direction of growth from an upright to an angular one. Thus, the growth, which started life as a robber, becomes a useful and fruitful member of the tree. Pruning back strong shoots, and long growths, will always encourage new lateral production, and that is what is mainly needed in citrus trees of all species.

Management of Crop.

Citrus fruits should always be clipped from the tree with a small portion of the twig attached to them. By so doing, the work of pruning is very much reduced, as this would ultimately have to be removed at pruning time. The process of clipping takes longer than pulling the fruit, but time is saved at pruning time. Besides, cut fruit keeps considerably longer than pulled fruit. The fruit should not be bruised; bruised fruit will quickly rot, and the rot spores will quickly infect the adjacent fruits in the packages.

One advantage that obtains, as a result of growing citrus fruits, is the fact that these fruits will keep for a much longer period than most other fruits. But the keeping qualities or powers more often depend on the picking and storing methods adopted. After gathering, the fruit will always improve by being sweated; the fruit may remain for several days in the cases into which it was picked, to allow the surplus moisture in the skin to evaporate. The cases should remain in an open, well ventilated building. This facilitates subsequent handling and packing, and the sweated fruit will keep much longer than if it were packed straight into the cases. If careful study and attention are given to the question of storing and keeping oranges and lemons, the producer will be able to keep a better regulated control over the prices he receives for his fruit. He will, in other words, be able to keep his fruit until it is most profitable for him to sell it, and at a fair amount of profit. Oranges and lemons, if cut and sweated carefully, may be cool-stored for a considerable time. Mr. W. French, Engineer-in-charge, Doncaster Cool Stores, estimates that oranges may be kept in the cool chambers at a temperature of 34 deg. Fahr. for from one to three months; while lemons may be stored for four months at a temperature of 38 deg. Fahr.

Curing the Fruit.

The question has often been raised as to why imported lemons will keep in a fine condition, and for a longer period than the local fruits. This is generally due to the following facts:—

First, that local fruits are picked when too ripe, and thus they will not keep for any considerable time. Lemons which are allowed to remain on the trees until they have well developed their colour, will never keep for any length of time.

Second, the cut fruits have not been sweated.

Third, the fruits have been handled carelessly and bruised. Fruits intended for keeping should be handled as carefully as one would handle eggs.

Fourth, imported fruits are generally submitted to a curing process before being packed and exported.

Lemons should be gathered for market long before they are at all coloured; coloured lemons are over developed, over ripe, and will not keep for any length of time. The fruits should be cut quite green, or, perhaps, when it is noticed that they are changing from green to a silver-green tone, when the tip of the fruit is beginning to turn lemon-coloured. If the fruit is required for immediate sale, then it may be coloured by being stored and stacked in a room where the temperature can be raised to and kept at about 92 deg. Fahr. The heat may be obtained from gas jets or from oil heaters. In either case, open vessels of water should be kept in the room, to keep up an adequate supply of oxygen and moisture in the air. The room should be free from draughts or air currents. The fruit will colour by this treatment in from four to seven days. It must be constantly watched; as, if the process is continued for too long a period, the fruit will rapidly deteriorate and soon decay. The fruit should, when well coloured, be slowly cooled before being despatched.

In California and in Italy, lemons are often cured by simply piling them under the trees in the shade of the foliage, and lightly covering them with grass or straw. Sometimes the fruits are packed alternately with layers of dry sand, and stored in a cool dry place.

The most general method is to pack the fruit in trays or shallow boxes, packing these in cellars or darkened stores, where the air is kept cool, fresh and dry; the stacks are covered with canvas, or with large tents. Under these conditions, the fruit will keep for months. The main features to be observed are:—keeping the temperature regularly cool, excluding air-currents and light, and keeping the air fresh and the rooms well ventilated. Good and proper ventilation is the main factor to success.

Varieties.

Fortunately, very few varieties of oranges, lemons and mandarins are catalogued by local nurserymen, and planters are thus less liable to make errors in planting than when a large number is listed. Probably the fact that seedlings take a very long time to fruit has prevented the multiplication of varieties.

On no account should seedlings be planted in the grove, unless for the express purpose of working over with recognized fruiting varieties. Seedlings are generally very slow in fruiting; some seedling trees were growing in the Bendigo district for over twenty years before they fruited.

When seedlings do produce fruit, in the majority of instances it is very inferior, thick-skinned, and very "raggy." A grove of over fifty seedling orange trees was at one time growing on the banks of one of the rivers in

the Goulburn Valley. Only three of these trees bore fruit that could be classed as commercially saleable, and then it was very inferior to any of the catalogued varieties.

Oranges.—The finest orange grown is the *Washington Navel.* The tree is a quick grower, but it does not finally grow so large as other varieties. It is a prolific cropper, and is seedless. It has been previously mentioned that the fruits of this variety attain a great size. Next to Washington Navel is the *Valencia Late.* It ripens late, is a strong grower, and very productive. *St. Michael Paper Rind* is a prolific variety, with medium

LISBON LEMONS GROWN AT BURNLEY.

sized fruit, very high quality, and thin-skinned. *Mediterranean Sweet* is a heavy bearer, and fairly late in season. The fruit is sweet and of fine flavour. The *Queen* is a fine round orange, thin-skinned, a good bearer, with fine-flavoured fruits.

These five varieties are the most suitable to plant for Victorian conditions, and will provide a good succession of fruits from early to late season.

The *Blood* or *Maltese* grows well in some Victorian districts, and is novel on account of its red juice, although the flavour is poor. *Seville* is the variety for marmalade, being of very bitter flavour. The fruit is large and flattened in shape. *Joppa* and *Jaffa* oranges are only grown locally in small quantities, although they are imported in considerable numbers from the Eastern Mediterranean ports. The fruits are large and oval. *Oonshiu* (*Satsuma*) is an orange that has come from Japan. It is reputed to withstand frosts, but we have had little experience of it.

MANDARINS.—Mandarins are only grown in small quantities. The two varieties generally grown, and producing payable crops, are the *Thorny* and *Emperor*. *Beauty of Glen Retreat*, a Queensland variety, is highly spoken of as a heavy cropper and a fine fruit in that State.

LEMONS.—There is only one lemon to be grown—the *Lisbon* lemon. All other varieties are poor and unacceptable, compared with this. The tree is a good bearer, of strong constitution, with well-flavoured fruit.

Eureka is popular in some parts of California. It is thornless, and a good keeper; but no experience of it is known in this State. *Villa Franca*, a summer-bearing variety, and *Lisbon Variegated* are also grown, but both bear very inferior fruits.

CITRONS, LIMES, AND SHADDOCKS.—Citrons, limes, and shaddocks also are included under the heading of citrus fruits. These are only sparsely grown in Victoria, and there appears to be little demand for them. They are used for preserving, jams and marmalade, candied peel, drinks, &c.

PROPAGATION

The young trees are propagated from seeds, layers, and cuttings. Whilst layers and cuttings produce directly the variety without the operation of budding, they are often used as well for stocks. It is supposed by some growers that the Lisbon lemon is far more hardy when grown from layers than when worked on to stock.

Seedlings are usually grown for stock, the resultant variety being budded on to these. The seeds should be saved from thoroughly ripe fruit, or the fruits should be rotted, the seed afterwards being washed and sifted out. Oranges may be worked on to lemon stock and *vice versâ*.

Seeds should not be saved indiscriminately. Seedlings grown from sweet oranges usually produce shallow-rooted trees. The reverse of this is needed for citrus trees. Deep-rooting is required, and only such stock as possess this requirement should be grown. The seedlings of the Seville, or bitter orange, are the best for the purpose, as they root deeper than any other. This is known in America as the Florida Sour Stock. Lemon seeds are rarely used for stock.

Another seedling stock that is largely used in California is the Pomelo or Grape Fruit (*Citrus decumana*). This is a tree of the shaddock section, and the fruit is quickly becoming popular in America.

In saving seeds, they should never be allowed to become dry. If not planted at once, they should be placed in damp sand until required for planting. The seeds should be sown in spring; and, when the seedlings are twelve months old, they should be placed in the nursery beds. After being there for one or two years, according to their growth, they may be budded. The trees may be budded in spring, summer, or autumn, but the late spring buds will probably give best results.

INSECT PESTS AND FUNGUS DISEASES.

Citrus trees are particularly subject to scale insects; red scale, brown or olive scale, white scale, wax scale, mussel scale, and cottony cushion scale being the most prevalent. The attacks of scale insects weaken the trees very considerably, particularly attacks of the red scale. The brown Lecanium scale is not so serious a trouble; while the cottony cushion scale is kept in check by attacks of ladybird larvæ and beetles.

Various sprays have been recommended for scale troubles, such as lime, sulphur, and salt, resin wash, crude petroleum emulsion, and red oil emulsion. Spraying with the best spray mixtures is only a partial remedy, and has to be constantly repeated.

Spraying citrus trees for scale is now obsolete in many parts both of America and Australia. There is only one effective way of scale eradication, and that is by fumigation with some noxious gas, which will suffocate the insect, but which will not injure the tree.

February is the best month for fumigating evergreen trees, notably trees of the citrus species, that are infested with any variety of scale. The trees should be closely enveloped in a fairly air-impervious sheet or tent, and hydrocyanic gas should be generated inside. The fumes of this gas are extremely dangerous, and the process should be carried out with great care. A safe charge for an average tree, that is, a tree about 12 feet high and about 10 feet in diameter, would be 4 ounces of cyanide of potassium, 4 fluid ounces of sulphuric acid, and 12 ounces of water. An earthenware, wooden, or enamel vessel should be used, and the acid should be measured into this first; then pour the water on to the acid, and when all is ready, the vessel being inside the tent, the cyanide should be dropped quickly into the liquid, and the tent closed down. Approximately, three-quarters of an hour is all the time necessary to fumigate the tree.

Fumigation is a dangerous operation in strong sunshine; the result of fumigating at such a time would be that the tree would probably be killed. Many growers, for safety sake, prefer to fumigate at night time. If done in the day time, a cloudy day should be selected, and the trees must be thoroughly dry. Fumigation is the easiest and surest method of completely eradicating red scale on citrus trees; and it has been performed with great success on both sides of the Dividing Range in Victoria.

Fortunately, the Fruit Fly pest is not prevalent in this State, and growers, as yet, are not troubled with its attacks.

Various fungi are to be found attacking citrus trees. The Soot fungus, which shows an appearance as if some sooty substance were adhering to the foliage and fruit, is a common trouble. This fungus is not a parasite on the tree, but is an attendant to the scale insects, and subsists on their sugary secretion. If the scale is eradicated, the fungus disappears; so that the remedy is to get rid of the scales, either by spraying or by fumigation.

"Wither tip" is another prevalent fungus disease. The foliage becomes blotched a brown colour, the fruit is covered with scabby patches, and dull grey blotches appear on the twigs. The laterals die, commencing from the tip downwards. All diseased parts should be pruned off and burned immediately; the tree should be stimulated with a pound or two or sulphate of iron, and given a good spraying with Bordeaux mixture.

By far the worst fungus trouble to be anticipated for citrus trees is the Collar Rot. The bark decays in patches at the collar or at the union of the scion and stock, particularly at or near the surface of the ground. Gumming frequently accompanies the rotting. The rotting of the bark

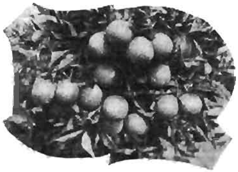
prevents return sap action, and the tree ultimately dies. As soon as observed, all diseased and unhealthy parts should be cut away and burned. The wounds, after being cut and cleansed, should be dressed with sulphur or a sulphur wash. The surface soil around the stem of the tree should be removed from the citrus area, and all tools, &c., used should be rendered antiseptic by dipping in Bordeaux mixture or in hot water before being again used in the citrus area. This is an infectious and serious disease. It is often the result of bad drainage, or of plough and other implement wounds.

Some growers consider their trees immune from this trouble, if the trees are grown from layers. The absence of any union would certainly be a great preventive, but should the tree trunk receive any wound, the fungus trouble would very readily occur.

A full account of all fungus diseases attacking citrus trees will be found in the work on *Fungus Diseases of Citrus Trees*, by Mr. D. McAlpine, published by the Department of Agriculture, Melbourne. Price 2s., postage 1d.

SOME "DONT'S" FOR CITRUS GROWERS.

Don't plant seedlings.
Don't break the ball.
Don't plant in a cold soil.
Don't plant in shallow soils.
Don't neglect drainage—natural or artificial.
Don't plant in heavy or clay soils.
Don't plant in frosty regions.
Don't use a spade near citrus trees.
Don't allow the soil surface to crust or cake.
Don't allow the foliage to flag or wilt.
Don't let the trees get thirsty.
Don't flood the grove—water in furrows.
Don't crowd the trees.
Don't retain any dead or defoliated twigs.
Don't pull or pick the fruits—cut them.
Don't bruise the fruit.
Don't allow the fruit to become too ripe on the trees.



PROPAGATION OF FRUIT TREES.

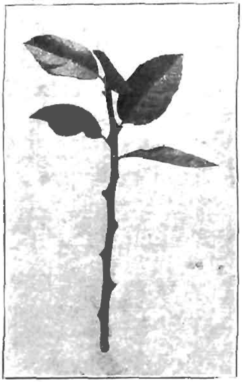
(Continued from page 486.)

C. F. Cole, Orchard Supervisor.

Stocks (*Continued*).

Citrus Family.

Several varieties of the citrus family are used as stock for propagating purposes; but for general use the following are the most suitable, viz., seedlings raised from the pips of the sweet and Seville oranges, and the rough common lemon. Trees worked upon the latter thrive well. This lemon is very hardy, stands excessive moisture to the roots, and is drought-resisting—more so than the seedling orange. Another variety, used for stock purposes and having dwarfing influence, is that known as *Citrus trifoliata*. This variety is more suitable for working the smaller growing kinds upon, such as mandarins, cumquats, &c.



17. CITRUS CUTTING PREPARED FOR PLANTING.

The writer's experience with the commercial varieties of lemons is that, when propagated upon their own roots, they are not suited for general purposes. Such trees are very unreliable and are more subject to fungus diseases, especially if planted in soil that is not well drained and has a poor or cold subsoil. They will not stand irrigation or an excess of water like trees worked upon the above-named stocks.

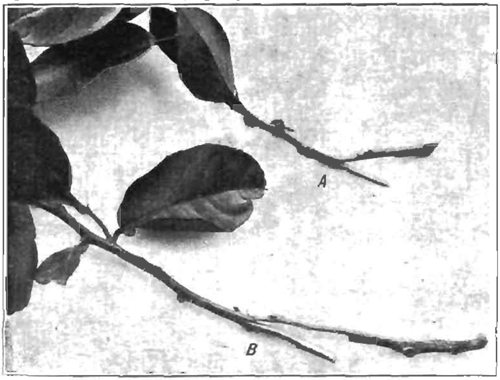
The citrus family can be propagated from cuttings or by layering, but the writer does not favour the general planting out of varieties so propagated, particularly the lemon.

When sowing pips, form drills in the same manner as when planting pear pips. (See page 368). Do not cover them with sand, but use light soil or mould. Sow in August or September. Water judiciously, and under no conditions allow the pips to become dry whilst germinating or at any time previous to the young seedlings becoming hardened. Shelter the seedlings from the hot sun in early summer with small leafy twigs or by some other simple device. If grown well, the majority will be suitable for planting out the following spring for working upon.

Cuttings can be readily rooted in a close frame placed upon a hot-bed, or in a glass house artificially heated. Plant cuttings in the autumn after the wood has hardened—about the month of May. The writer has rooted cuttings planted in early spring in a cool house; also in the open, in a warm district. This should not be practised. Prepare cuttings the same as Fig. 17. Select well matured wood, and cut with sharp knife, at an apex bud. Make cuttings 6, 10, or 12 in. in length.

Layering should be carried out in December or early January, the rooted layers being lifted the following spring. When performing this operation, the cut should be made almost straight in and about three parts through the stem to be layered. Then turn the blade upwards, cutting about 1½ in. along the stem. (See Fig. 18B). Several causes may be the means of preventing this cut portion from rooting, viz. :—

(1) Callusing at the terminal end of the cut and stem. This can be prevented by inserting a small piece of twig or wood crosswise between the freshly made cut and stem. When layering some species of plants, it can be overcome by giving the cut twig a slight twist and slightly inclining it in a vertical position before pegging down. But, with those plants or trees having hard or brittle wood, the cut should be made upon the underside of the twig to be put down. When pegging down, slightly lift the twig in a vertical position. This action will cause the cut part to open and remain so. (Fig. 19).



18. CUTTING CITRUS LAYERS.

A. Wrong method. B. Correct method.

(2) By cutting with a blunt or thick bladed knife, and thereby bruising the bark and cambium at place of entry, this being the part where rooting takes place.

(3) By allowing the cut to become dry from the want of moisture previous to the hardening of the roots.

(4) By excessive waterings causing the callus to decay.

(5) By starting the cut correctly, and then running it thinly towards the terminal end instead of cutting it a uniform thickness the whole length as in Fig 18B.

(6) By starting the cut in a sloping shallow way and running it thinly like Fig. 18A.

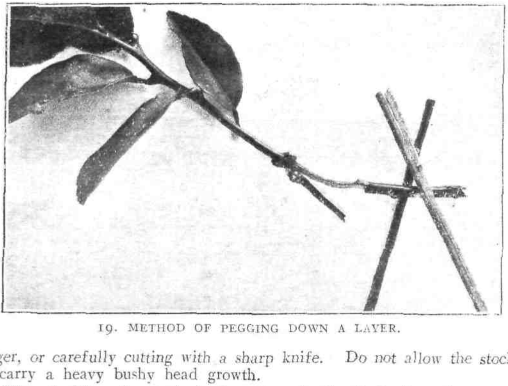
Although it is not always necessary to start the cut just below a bud it is advisable to do so, where possible. The writer has made the cuts otherwise, so as to illustrate them more clearly.

Before replacing the soil to cover the pegged down layer, apply a little wash sand or sandy soil about the cut if the soil is heavy.

The object of dealing fully with layering is for the information of readers who are not conversant with this method of increasing a variety. It is practised with many of our evergreen fruiting and flowering trees and shrubs. Most of our choice varieties of oranges and lemons are benefited by budding or grafting them upon another variety suitable as a stock in every respect to the variety worked upon it. This is explained fully upon pages 338-9.

Seedlings should be lifted from the seed beds in August or September. The tap root, if any, should be cut back. Upon lifting, plant out immediately where they are to remain for working upon. Select dull calm weather, if possible. Do not allow the stocks to get dry—keep covered with a damp sack; temporarily heel in or cover the roots with soil when planting out. If necessary, lightly water the stocks when planted, and continue this treatment when required throughout the summer months.

The stocks should be kept well trimmed, and all robbers, *i.e.*, superfluous shoots, removed either by rubbing them off with the thumb and



19. METHOD OF PEGGING DOWN A LAYER.

finger, or carefully cutting with a sharp knife. Do not allow the stocks to carry a heavy bushy head growth.

When budding, insert the buds well up in the stocks from the ground level (see Fig. 20). Watch the binding to see that it does not cut into the rapidly-expanding stock. When unity has taken place, reduce the head of the stock—this will be the means of starting the bud into growth. Some propagators tie the growing shoot carefully to that part of the stem which is left above the bud (Fig. 20), so as to protect it from rough winds, and to insure a straight vertical growth. When the growth is hardened and no support is necessary, this portion of the stock is removed down to the bud, making a clean upward cut. A future article will deal with the proper method of making this cut.

Another method, and one that the writer practised, is to reduce the stock back to the inserted and moving bud—the same as deciduous fruit

tree treatment—and support the growing bud with a suitable stake. A straight stick or piece of split paling, about 18 to 24 in. in length, answers the purpose.

All shoots upon the stem of the stock should be systematically removed, otherwise they will utilize the ascending sap and starve the growing bud somewhat. When the bud is about 18 in. long it should be topped so as to encourage it to push our branches.

If budded upon healthy, vigorous-growing stocks and receiving careful treatment, many of the buds inserted in December or January will be suitable for planting out during the following winter. Fig. 20 is that of a Lisbon lemon tree, ten months from bud, that was propagated in the metropolitan district. In the nursery, the growth of the lemon is generally more rapid than that of the orange.

20. LISBON LEMON—10 MONTHS' GROWTH FROM BUD.

21. ONE METHOD OF SUPPORTING GROWING CITRUS BUD.

Grafting should be performed in early spring when the sap is moving. Select well-matured wood for scions.

The writer advises those who intend to propagate varieties of the citrus family to plant in 3-row or 4-row lands. This will insure better drainage, which is most essential when propagating or growing this class of fruit. It also greatly reduces the risk of losing young trees through excessive moisture when irrigating.

Under normal conditions, citrus trees are easily propagated. Any one taking up this work in a warm irrigated district would find it remunerative—very few of the citrus trees planted out in this State are raised here. Like the olive, citrus trees require a percentage of lime in the soil to obtain the best results. Soil conditions were dealt with by *Mr. E. E. Pescott, Principal, Burnley Horticultural School, in the June* issue of the *Journal.*

There is always a risk of losing citrus trees when transplanting from a hot to a cooler climate. At one time, imported trees were generally acclimatized by nurserymen before being sold to the growers for permanent planting. This is still practised, but not to the same extent. There is a difference in price between acclimatized and unacclimatized trees. If growers choose the latter they run the risk of failure. After all, this risk is not very great with healthy trees, if given careful treatment.

The trees should be obtained in August or September, and immediately upon receiving them they should be removed from the package or case in which they are packed. The roots should be carefully and well rinsed in water, so as to remove any puddled clay or sawdust adhering to them. Then cut away any bruised roots or portion of roots so effected. Harden back their growth about one-half, making a clean and unbruised cut at a bud. Use a sharp knife. Then heel in at once in a warm sheltered position, away from the influence of frosts, until planted out permanently. Press the soil firmly about the roots, and water. Under no conditions allow them to suffer from the want of moisture before the autumn.

If the soil has not already been prepared it should be worked deeply. It should, if possible, be of a loose sandy or loamy nature, and be well drained. Select a warm sheltered site.

When planting, open out a trench to the required depth, and plant *about 12 in. apart, so that, if necessary, they can be lifted with a small* ball of soil for planting out the following seasons. Spread the roots when planting, care being taken to see that the trees are placed no deeper in the soil than when they were lifted from the nursery. The rows should be far enough apart to prevent injury to the young growths when cultivating amongst them.

One of the chief factors in acclimatization is to keep the soil well stirred or mulched, and, as nearly as possible, of even moisture, *i.e.*, a moisture not detrimental to the health of the trees. Many propagators plant the trees just as they receive them from the nursery, not hardening back the growth. The writer has tested both methods, and favours cutting back.

When irrigating, care should be taken that one portion of the trees does not receive an excess over the others. If unmulched, the surface of the soil should be well stirred to prevent crusting. This will also help to conserve the moisture. During hot weather, water in early morning or evening. If irrigating during the heat of the day, there is a risk of scalding the bark, *i.e*, if the water is allowed to splash upon the stems.

It is a common occurrence for citrus trees to shed their foliage after being planted out and to remain dormant until the autumn, when they break away after the first good rains and make fair growth before the cold weather sets in. Again, others remain in this condition; they respond to no treatment, and finally die out, too severe a check through removal being probably the cause. Very often, they will start to die back from the tips, continuing down close to the bud mark where a few buds have pushed forth shoots. When this occurs, the top should be cut

back to the growing shoots. But the operator should be careful to see that these shoots are not below, but above the bud mark.

Olive.

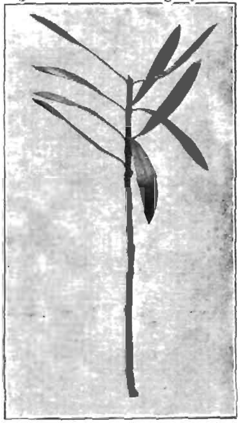
As olive seed does not always come true or resemble in quality, &c., the variety from which it was saved, it is necessary, when a superior seedling or variety is to be increased, to resort to budding, grafting, stooling, or cuttings.

To raise stock for working upon, save the seed from any vigorous and productive kind. Sow in drills 1 in. in depth and cover with light soil; the seed should be sown as soon as the fruit is ripe. Seedlings may be lifted and planted out the following winter for working upon.

Cuttings should be prepared and planted out in the autumn. Cut at an apex bud, leaving some of the foliage (see Fig. 22). When preparing the scion for grafting, it is well to leave a little of the foliage on. Bud the same time as citrus fruits. Graft when the growth is active in early summer, or when the sap is moving.

Rooted cuttings, as well as seedlings, may be used for working upon. See that the stocks are watered and growing freely before attempting to work them. By cutting back a well-established young tree, at or near the ground level, it will send up numerous shoots. If moulded up with light soil, these suckers will root; remove them in May or June. Re-mould again in early summer.

To propagate by this method, the variety should be upon its own roots, otherwise there is a big risk of getting shoots from the stock as well as the worked variety. Large trees that are not suitable can be headed back and grafted or budded over. If budding, remove all surplus shoots, only leaving those required for this purpose.



22. OLIVE CUTTING PREPARED FOR PLANTING.

Plant out olive trees from May to September. The olive is hardy, and thrives upon any deep well-drained soil having a warm subsoil. It will not thrive if over-irrigated or growing upon impervious soils. To obtain the best results, the soil requires lime, *i.e.* if the soil is deficient in this property.

It is a valuable tree to grow as a break-wind for citrus trees cultivated in the warm and irrigated districts. If suitable varieties are grown, the fruit can be utilized for making oil. The illustration on page 528 shows a fruiting twig taken from a seedling variety. The fruit is small as compared with that of choice and selected kinds in general cultivation.

A method of propagation sometimes practised in European countries where the olive thrives, is to remove the knot-like forms on the bark of the trunk and large branches. To do this, insert the point of the knife and make a circular incision about the knots. They are then easily removed. This operation will not injure the parent tree. The knots are then planted similarly to small flowering bulbs, in drills about 1 in. in

depth. If planting olives purely as a break-wind or evergreen shade tree, the seedling is the thriftiest.

WALNUT.

The walnut may be propagated by planting the nuts, or by budding and grafting upon seedlings raised from nuts saved from some hardy variety.

The nuts should be sown in drills made the same as when planting apricot stones, &c. The drill should be about 2 in. in depth. Cover with sand or light soil.

Grafting should be done in early spring before active growth takes place; and budding in mid-summer when the bark lifts readily.

23. FRUITING TWIGS OF SEEDLING OLIVE.

Being hardy, the walnut thrives in most parts of the State, except where the soil is dry and hot. The cooler mountainous districts are very suitable for propagating. The soil for propagating or growing should be loose and well drained with a warm subsoil.

When lifting for re-planting, the tap root should not be damaged. If so, there is a risk of it decaying and piping, especially if the soil is of a retentive nature, and the drainage faulty. The surest sign of the root being affected is the tips of the branches or twigs dying back.

Young walnut trees very seldom require pruning when planting out.

HAZEL NUTS.

These nuts are easily propagated from suckers or stools. Mould and treat similarly to apple stools (see page 367).

The best varieties can be grafted upon the hardier ones. This operation should be performed at the same time, and in the same way as ordinary deciduous fruiting trees, *i.e.*, in early spring.

The cooler or mountainous districts having a good average rainfall are the most suitable for propagating or growing these nuts. The trees flourish best upon a deep free soil.

Currant and Gooseberry.

The best method of propagating these two kinds of small fruits is from cuttings.

Select straight well-matured past-season's growths, and make into cuttings about 12 or 14 in. in length. Remove all buds or eyes, excepting two, three, or four near the terminal end of the cutting. When removing the buds, use a sharp knife. Do not break the buds out, but cut clearly, removing the node as well. If this is neglected, they will probably send up suckers.

Plant the cuttings down half their length in the soil and about 3 to 4 in. apart. Keep well watered, if necessary, during the summer months. The following winter they may be lifted, pruned and planted out permanently.

These small fruits require a cool district having a good average rainfall, if they are to be grown to perfection. They prefer a deep loose soil with good drainage. As the Root Rot fungus (*Armillaria mellea*) is prevalent in the mountainous districts suitable for propagating or growing these fruits, the instructions *re* preparation of soil, given on page 342, should be followed. A dressing of lime will greatly lessen the risk of attack, besides benefiting the soil, if deficient in that constituent.

Vine.

The vine is now chiefly propagated by using the phylloxera-resistant varieties as stock for working upon, bench or field grafting being practised.

Cuttings or layers root freely. If layering, peg down the young matured growth in the winter. When making an incision, cut just below a bud. When preparing cuttings, cut below an apex bud. Do not remove any buds from the cuttings.

(To be continued.)

ORCHARD AND GARDEN NOTES.

E. E. Pescott, Principal, Horticultural School, Burnley.

The Orchard.

August is the month when a good amount of orchard work requires completion, and when a new lot of work must be started. It is really the beginning of the orchardist's year. Pruning should be completed, winter spraying and manuring should be finished, and planting of deciduous trees should be at an end.

If any of these works remain unfinished, they should be pushed on at once, as it will be necessary, towards the end of the month, to consider the coming spring operations. One season's work should be completed thoroughly, before the time arrives to commence the next set of operations.

In addition to the completion of these necessary works, a start should be made, if it has not already been done, to prepare for the planting

of citrus trees next month. This subject was fully dealt with in the article on "Citrus Fruit Culture" in the June issue.

A sharp lookout should be kept for the root borer beetles which, particularly in the warmer districts, often appear towards the end of August. If the pest is at all present, trapping should be resorted to. The trees should be well examined for the eggs, which are generally laid near the top of the branches, the leaf on which the eggs are laid being folded over.

A watch will need to be kept, too, for peach aphis, which makes its advent in the spring. This insect multiplies so rapidly, once it does appear, that, on the first indication of its presence, the trees should be sprayed with a strong tobacco solution. They should be examined on the day after spraying, and if any aphides are still alive, another spraying should be given.

A vigilant watch, and constant sprayings in the early season, will check this pest, and will be the means of saving much time next month when it will be urgently needed for other works. Peach, almond, and Japanese plum trees are attacked by the peach aphis. This is also the season when the bryobia mite (red spider) is hatching and breeding. If the trees have received an oil emulsion in the winter, no danger may be feared from this mite. But if not, then an effort must be made to keep it in check by spraying the trees with strong nicotine solution or with one of the proprietary mixtures now on the market. The foliage and young buds are greatly damaged by the attacks of this mite, and so to allow full leaf action, it should be attacked before the flowers or foliage come.

Woolly aphis will also need attention. If any of these insects are remaining on the trees at the present time, no effort should be spared to eradicate these. This aphis multiplies quickly in the spring.

Vegetable Garden.

Asparagus beds may still be planted, and the old beds should be well weeded and cleaned out, finally giving them a good manurial top dressing. Full directions for the management of asparagus gardens were given in last month's *Journal.*

All herbs may be divided and planted out; and any seedlings ready may also be set out in the beds. Such plants as suffer from frosts, if planted out, must be protected and covered.

Tomato seeds may be planted in the frames, as well as seeds of cucumbers, melons, marrows, pumpkins, and celery; and, in the open beds, such seeds as cauliflower, cabbage, carrots, beans, peas, radish, and lettuce may be planted. Onions may be transplanted from the seed beds.

The beds will need constant hoeing; all weeds must be killed, and the surface should be kept worked up fine and loose.

Flower Garden.

All winter flowering shrubs that have dropped their blossoms may now be pruned. It is important to prune these immediately after flowering, so that the plant may be able to make plenty of flowering wood for next season.

Seed beds and plots need constant cleaning and weeding. Weeds must now be kept out of the garden, both by hoeing and handpicking. The seedlings that are growing in their permanent situations should be thinned out and given a good chance to develop strong and sturdy plants.

Divisions of herbaceous plants such as Delphiniums, Cannas, Shasta Daisy, herbaceous Chrysanthemums, Rudbeckias, Salvias, and Phlox may still be planted out. If it is intended that such plants shall remain in the same location as last season, they should be lifted, the soil being well dug and manured, and the crowns planted back again. By these means, the plants retain their vigour, and are able to produce good flowers each season.

Evergreen shrubs may now be planted out, the soil having previously been well dug and aired. All beds should be well dug over by this time, manure and refuse litter having been dug into the soil.

A few corms and tubers of early summer flowering bulbous plants may now be planted.

STORAGE TEST OF SHIPPING GRAPES.

F. de Castella, Government Viticulturist.

Of the numerous vines introduced by the writer in 1908 and planted at the Viticultural College, Rutherglen, a list of which appeared in the Report of the Department, 1907-10, several bore fruit for the first time this year.

As some of these promise to be of value as shipping grapes, it was decided to test them by storage in cool chamber, packed in cork dust. These grapes went into the Government cool stores on 27th April last, being picked and packed a few days previously. They were opened and examined on 10th July, so they had been nearly three months in cool storage, where they were kept at a temperature of between 33 degrees and 34 degrees Fah.

On being opened, they were examined by Messrs. J. G. Turner, Chief Horticultural Officer, B. W. Bagenal, and the writer. Notes were made and points awarded, the latter according to a scale from 1 to 10.

Ohanez.—These opened in almost perfect order. Under 1 per cent. of damaged berries, stalks quite green, and the fruit almost as fresh as though it had been just picked off the vine. 10 points.

Olivette Vraie.—A very pretty large white grape, distinctly oval or olive shaped. Order nearly equal to Ohanez. 9½ points.

Teneron du Cadenet.—Very good order. The berries were bronzed on one side; they were evidently riper than the previous ones when packed. Probably a good shipping grape for districts too late for Ohanez. 9 points.

Malvoisie des Chartreux.—Very good order. Some berries bronzed. Very large handsome bunch; large oval berry, remarkably crisp and of delicious flavour. Stalks very green and berries adhering firmly to them. Though a few berries were discoloured, the decay was not communicated to adjoining berries. 8½ points.

Malaga Rose.—Very good order. Some of the berries slightly shrivelled. Evidently an earlier grape than Ohanez. A pretty, oval, bright red grape, though the berries are not very large. 8 points.

Servan.—The skin of this white grape is not so thick as the former sorts and the pulp is more juicy; nevertheless, it opened in very fair order. 7 points.

Kuristi Mici.—Small compact bunch; red berry. Fair order. 6 points.

Olivette Rose.—Not nearly so good as the White Olivette mentioned above. The stalks were very dry and the bunch, which is very loose, had a perished appearance though few berries were unsound. 5 points.

Valensy.—Very poor order. Nearly half the berries were unsound and they all had a more or less mouldy taste. It is strange that this grape stood the test so badly seeing that it is the variety largely shipped from Jijona (Spain). Further trial wanted (4 points).

Doradillo.—For purposes of comparison a couple of cases of this grape, which has already been proved to be a good shipper, were also opened. One of these was from Wahgunyah. Though at first the fruit appeared to be in excellent order, it was found on taking out the bunches that a good many berries were faulty—this case was awarded 8 points. The second case, from Mooroopna, was in better order, and was awarded 9 points.

Black Grape from Tatura.—This grape, grown by Mr. A. M. Simson, opened in very good order. Its name is unknown, but in view of the demand for black grapes in London it is well worthy of further trial. The skin is thick and the pulp juicy—as the flavour was still fairly acid this is evidently a very late grape. 8½ points.

* * * * * * * * *

These grapes were all picked after the heavy rains of last autumn. The test was thus a severe one. In an ordinary season they would no doubt have opened in much better order. It must also be remembered that the first fruits of young vines do not usually possess equal keeping powers to those borne by older vines.

VERNACULAR NAMES OF VICTORIAN PLANTS.

(*Continued from page 390.*)

Communicated by Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Chairman, and C. S. Sutton, M.B., Ch. B., Secretary, of the Plant Names Committee of the Victorian Field Naturalists' Club.

MONOCOTYLDONEÆ—*continued.*

Botanical Name.	Popular Name.	Use or Character.
	MONOCOTYLEDONEÆ—ACALYCEÆ—HYPOGYNÆ.	
CYPERACEÆ.		
Kyllingia—		
intermedia, R.Br.	Globe Kyllingia	
Cyperus—		
Eragrostis, Vahl.	Dark Leaf Rush	Have a very slight fodder value. *C. vaginatus* is a useful fibre plant
globosus, Allioni	Rough Leaf Rush	
unioloides, R.Br.	Mussel Leaf Rush	
pygmæus, Rottb.	Dwarf Leaf Rush	
tenellus, L.	Delicate Leaf Rush	
gracilis, R.Br.	Slender Leaf Rush	
squarrosus, L.	Tufted Leaf Rush	
difformis, L.	Distorted Leaf Rush	
trinervis, R.Br.	Three-nerved Leaf Rush	
concinnus, R.Br.	Neat Leaf Rush	
vaginatus, R.Br.	Sheath Leaf Rush	
rotundus, L.	Nut Sedge	A troublesome weed, with nut-like underground tubers, which render the plant very hard to eradicate. Proclaimed under the Thistle Act for the whole State
lucidus, R.Br.	Shining Leaf Rush	Yield a fibre by boiling and scraping the leaves
exaltatus, Retzius	Smooth Leaf Rush	
Heleocharis—		
sphacelata, R.Br.	Tall Spike Rush	Slight fodder value when young
acuta, R.Br.	Common Spike Rush	
multicaulis, Smith.	Many-stalked Spike Rush	
acicularis, R.Br.	Needle Spike Rush	

Vernacular Names of Victorian Plants—*continued.*

Botanical Name.	Popular Name.	Use or Character.
Monocotyledoneæ—Acalyceæ—Hypogynæ—*continued.*		
Cyperaceæ—*continued.*		
Fimbristylis—		
velata, R.Br.	Veiled Fringe Rush ..	
aestivalis, Vahl... ..	Summer Fringe Rush ..	
communis, Kunth. ..	Common Fringe Rush ..	
Scirpus—		
fluitans, L.	Floating Club Rush ..	
arenarius, Benth. ..	Sand Club Rush ..	No known economic value
crassiusculus, *Hook. f.* ..	*Alpine Club Rush* ..	
setaceus, L.	Bristle Club Rush ..	
riparius, Spreng. ..	Grassy Club Rush ..	
cartilagineus, Spreng. ..	Gristle Club Rush ..	
inundatus, Spreng. ..	*Swamp Club Rush* ..	
prolifer, Rottb.	Budding Club Rush ..	
nodosus, Rottb... ..	Knotted Club Rush ..	Tufty sedge, with widely creeping rhizomes; useful for binding drift sand; *will grow in saline wet places;* produces paper pulp
supinus, L.	Soft Club Rush ..	
mucronatus, L.	Pointed Club Rush ..	No known economic value
pungens, Vahl.	*Sharp Club Rush* ..	
lacustris, L.	Lake Club Rush ..	Fibre plant used for making seats of chairs and by coopers in caulking casks. Eaten by stock in times of drought
maritimus, L.	Salt-marsh Club Rush ..	Grow in wet or swampy places; no known economic value
polystachyus, F.v.M. ..	Spicate Club Rush	
Lipocarpha—		
microcephala, R.Br. ..	Button Rush	
Chorizandra—		
cnodis, Nees.	Black Bristle Rush ..	
cymbaria, R.Br. ..	Heron Bristle Rush ..	
Oreobolus—		
Pumilio, R.Br.	Alpine Tuft Rush ..	
Cyathochæte—		
diandra, Nees.	Sheath Rush	No known economic value
Carpha—		
alpina, R.Br.	Alpine Flower Rush ..	
Schœnus—		
aphyllus, Bœck. ..	Leafless Bog Rush ..	
imberbis, R.Br. ..	Beardless Bog Rush ..	
ericetorum, R.Br. ..	Heath Bog Rush ..	
nitens, Poiret	Shining Bog Rush ..	
nanus, F.v.M.	Tiny Bog Rush ..	
brevifolius, R.Br. ..	Short-leaved Bog Rush ..	Furnishes a fine fibre of considerable strength; also good paper material
melanostachys, R.Br. ..	Black Bog Rush ..	
apogon, Rœmer and Schult	Fluke Bog Rush ..	
sculptus, Bœck... ..	Gimlet Bog Rush ..	
axillaris, Poiret. ..	Dwarf Bog Rush ..	
capillaris, F.v.M. ..	*Bristle Bog Rush* ..	No known economic value
sphærocephalus, Poir. ..	Button Bog Rush ..	
pauciflorus, F.v.M. ..	*Needle Bog Rush* ..	
Lepidospora—		
tenuissima, F.v.M. ..	*Coast Bog Rush* ..	
Lepidosperma—		
gladiatum, Labill. ..	Coast Sword Sedge ..	Suitable for binding sea sand; also yield a good paper material
elatius, Labill.	*Tall Sword Sedge* ..	
exaltatum, R.Br. ..	Giant Sword Sedge ..	Yields a good paper pulp
longitudinale, Labill. ..	Swamp Sword Sedge ..	
concavum, R.Br. ..	Hill Sword Sedge ..	
viscidum, R.Br. ..	*Sticky Sword Sedge* ..	
laterale, R.Br.	Broad Sword Sedge ..	
globosum, Labill. ..	Clustered Sword Sedge ..	
lineare, R.Br.	Narrow Sword Sedge ..	No known economic value
semiteres, F.v.M. ..	*Wire Sword Sedge* ..	
canescens, Bœck. ..	Hoary Sword Sedge ..	
tortuosum, F.v.M. ..	Twisting Sword Sedge ..	
filiforme, Labill. ..	Thread Sword Sedge ..	
Neesii, Kunth.	*Stiff Sword Sedge* ..	
carphoides, F.v.M. ..	Mueller Sword Sedge ..	Stock usually leave the plant untouched; *no known economic value*

VERNACULAR NAMES OF VICTORIAN PLANTS—*continued.*

Botanical Name.	Popular Name.	Use or Character.
MONOCOTYLEDONEÆ—ACALYCEÆ—HYPOGYNÆ—*continued.*		
CYPERACEÆ—*continued.*		
Cladium—		
Mariscus, R.Br. ..	Saw Cutting Sedge ..	No known economic value
articulatum, R.Br. ..	Jointed Twig Rush ..	
glomeratum, R.Br. ..	Soft Twig Rush ..	
tetraquetrum, Hook. f. ..	Angular Twig Rush ..	
schœnoides, R.Br. ..	Small Twig Rush ..	
Gunnii, Hook. f. ..	Slender Twig Rush ..	
junceum, R.Br. ..	Bare Twig Rush ..	
Filum, R.Br.	Awned Twig Rush ..	
Gahnia—		
trifida, Labill.	Awned Saw Sedge ..	Useful for thatching, and possibly for weaving
microstachya, Benth. ..	Slender Saw Sedge ..	
lanigera, Benth. ..	Little Saw Sedge ..	
Radula, Benth.	Black Saw Sedge ..	Useful for thatching purposes and to brick-making. Yields a fibre
tetragonocarpa, Bœck. ..	Mountain Saw Sedge ..	Yield a fibre
melanocarpa, R.Br. ..	Black Fruited Saw Sedge	
psittacorum, Labill. ..	Giant Saw Sedge ..	
Caustis—		
pentandra, R.Br. ..	Common Twisted Rush ..	No known economic value
flexuosa, R.Br.	Curly Wig ..	
restiacea, F.v.M. ..	Tall Twisted Rush ..	
Uncinia—		
tenella, R.Br.	Delicate Hook Sedge ..	
compacta, R.Br. ..	Mountain Hook Sedge ..	
riparia, R.Br.	River Hook Sedge ..	
Carex—		
cephalotes, F.v.M. ..	Roundhead Sedge ..	
acicularis, Boott. ..	Dwarf Sedge	
inversa, R.Br.	Knob Sedge	
canescens, L.	Hoary Sedge	
echinata, Murray ..	Prickle Sedge	
hypandra, F.v.M. ..	Dark Sedge	
chlorantha, R.Br. ..	Pale Sedge	
paniculata, L.	Panicle Sedge	Yields a strong fibre material
declinata, Boott. ..	Rough Sedge	No known economic value
tereticaulis, F.v.M. ..	Round Sedge	Yields a strong fibre material
cæspitosa, L.	Tufted Sedge	No known economic value
acuta, L.	Slender Sedge	
fusca, *Allioni* (C. Buxbaumii)	Tawny Sedge	
pumila, Thumb. ..	Spreading Sedge ..	Binds loose sand
breviculmis, R.Br. ..	Short-stemmed Sedge ..	No known economic value
Gunniana, Boott. ..	Green Sedge	
lacistoma, R.Br. ..	Grass Sedge	
alsophila, F.v.M. ..	Broad Sedge	
longibrachiata, Bœck. ..	Long-leaved Sedge ..	
Pseudo-cyperus, L. ..	Galingale Sedge ..	Yields a paper pulp
GRAMINEÆ.		
Eriochloa—		
punctata, Ham... ..	Woolly Grass	Good pasture grass; stands drought fairly well
Panicum—		
cœnicolum, F.v.M. ..	*Kanta Grass*	*Good grass for moist meadows.* The grain is eaten by aborigines of South Australia
divaricatissimum, R.Br. ..	Spider Grass	This variable grass is drought-resisting; yields nutritious fodder
sanguinale, L.	Summer Grass	Fairly useful pasture grass; binds loose damp soil, but a troublesome weed in gardens
leucophæum, Humb. and Kunth.	Cottony Panic Grass ..	Good grass for the dry districts, but improves on good moist soil. The fibrous portion of the leaf is used by Queensland aborigines to make twine

VERNACULAR NAMES OF VICTORIAN PLANTS—*continued.*

MONOCOTYLEDONEÆ—ACALYCEÆ—HYPOGYNÆ—*continued.*

Botanical Name.	Popular Name.	Use or Character.
GRAMINEÆ—*continued*		
Panicum—continued—		
gracile, R.Br. ..	Slender Panic Grass ..	Of some use when young, but becomes tough and wiry when older
Crus galli, L. ..	Barnyard Grass ..	Good grass in moist situations, especially around stagnant water
repens, L. ..	Creeping Panic Grass ..	Grows well in shady places
marginatum, R.Br. ..	Bordered Panic Grass ..	Good pasture grass, though not in the first rank
bicolor, R.Br. ..	Coloured Panic Grass ..	Useful grass, hardy and palatable to stock
melananthum, F.v.M. ..	Black Seeded Panic Grass	This widely spread grass yields a fair amount of nutritious fodder
effusum, R.Br. ..	Hairy Panic Grass ..	Useful for pasture; alike in coastal districts and dry interior
Mitchelli, Benth. ..	Spreading Panic Grass ..	Very good pasture grass
decompositum, R.Br. ..	Umbrella Grass ..	Useful for pasture. The aborigines make the millet-like grains into cakes
trachyrhachis, Benth. ..	Rough Panic Grass ..	Useful for pasture. A coarser plant than the foregoing, but has similar properties
prolutum, F.v.M. ..	Pallid Panic Grass ..	Like the two preceding species, is a valuable grass for the interior of Australia
spinescens, R.Br. ..	Spiny Panic Grass ..	Of slight pasture value. A semi-aquatic grass; forms a good sward as the water recedes
paradoxum, R.Br. ..	Thorny Panic Grass ..	Semi-aquatic grass, similar to *P. spinescens*
atro-virens, Trinius ..	Swamp Panic Grass ..	Swamp loving grass, nutritious and relished by stock
Oplismenus—		
compositus, Palisot. ..	Creeping Beard Grass ..	Too closely spread on the ground to be of much use as a pasture grass
Setaria—		
glauca, Beauv. ..	Pale Pigeon Grass ..	Good pasture grass for covering newly broken up moist soil; becomes a weed in gardens and orchards
macrostachya, Humb. and Kunth.	Bearded Pigeon Grass ..	Introduced from other States. Useful for cutting as green fodder or for grazing
viridis, Beauv. ..	Green Pigeon Grass ..	Introduced and naturalized by cultivation. Useful for forming the first covering over dry, sandy, or calcareous soils
verticillata, Beauv. ..	Whorled Pigeon Grass ..	Introduced from other States; similar in value to *S. viridis*
Spinifex—		
hirsutus, Labill. ..	Hairy Spinifex ..	Valuable as a sand-stay around the sea coast; of slight pasture value
paradoxus, Benth. ..	Spreading Spinifex ..	Not palatable to stock. It is a good sand-binder for hot dry regions
Tragus—		
racemosus, Haller ..	Small Burr Grass ..	Though small, is a useful pasture grass for winter and early spring
Neurachne—		
alopecuroides, R.Br. ..	Foxtail Mulga Grass ..	Though a coarse grass, is of fair pasture value, especially in summer
Mitchelliana, Nees. ..	Mitchell Mulga Grass ..	Grows well under the protection of shrubs and stones; stands severe drought, and is liked by stock
Munroi, F.v.M. ..	Munro Mulga Grass ..	Useful grass in sheltered places
Zoysia—		
pungens, Willd. ..	Prickly Couch Grass ..	Valuable for binding sandy land near the sea, and is palatable to stock
Imperata—		
arundinacea, Cyr. ..	Blady Grass ..	Grows in wet undrained land; of slight pasture value; useful for thatching
Erianthus—		
fulvis, Kunth. ..	Browntop ..	Showy, moderately tall grass, and is drought-resisting
Lepturus—		
incurvatus, Trinius ..	Curved Snaketail Grass ..	Generally found in salt-marshes in coastal districts; of not much pasture value
cylindricus, Trinius ..	Smaller Snaketail Grass ..	Similar to *L. incurvatus*
Hemarthria—		
compressa, R.Br. ..	Mat Grass ..	Suitable for undrained, heavy, clay, or wet sour soils

Vernacular Names of Victorian Plants—*continued*.

Monocotyledoneæ—Acalyceæ—Hypogynæ—*continued*.

Botanical Name.	Popular Name.	Use or Character.
Gramineæ—*continued*.		
Andropogon—		
erianthoides, F.v.M.	Satintop Grass	Introduced from other States. A good fodder grass; useful for hay
sericeus, R.Br.	Silky Blue Grass	Valuable alike for pasture and for hay; has good fattening properties
affinis, R.Br.	Brown Beard Grass	One of our best native pasture grasses; useful also for hay
pertusus, Willd.	Pitted Beard Grass	Excellent perennial pasture grass; stands drought well
annulatus, Forsk.	*Ringed Beard Grass*	*Good grass for pasture or for hay*
intermedius, R.Br.	Coarse Beard Grass	Rather coarse grass; yields a fair amount of nutritious fodder when young
bombycinus, R.Br.	Woolly Beard Grass	Drought-resisting; useful for pasturage when young
refractus, R.Br.	Turpentine Grass	Fairly good fodder grass. The coarse hay of this species is used by Fijians for mattresses
Gryllus, L.	Cricket Grass	Good pasture grass, with a good leafy bottom
micranthus, Kunth.	Scented Beard Grass	Good pasture grass when young, but becomes harsh and wiry when older
halepensis, Sibth. and Smith	Johnson Grass	Introduced from other States. A good fodder grass, also for hay, but becomes troublesome in cultivated ground, as its deep and spreading roots mat the soil
australis, Spreng.	*Southern Beard Grass*	*Good fodder grass for cattle, but not for sheep*
Anthistiria—		
ciliata, L.	Kangaroo Grass	This is one of the best of our perennial native fodder grasses; useful for hay. Horses and cattle are fond of it
avenacea, F.v.M.	Oat Kangaroo Grass	Valuable grass for dry situations; useful for hay
Alopecurus—		
geniculatus, L.	*Bent Fox-tail Grass*	*Valuable perennial fodder grass for swampy or moist ground*
Tetrarrhena—		
distichophylla, R.Br.	Hairy Rice Grass	Too tough to be of much use for fodder
juncea, R.Br.	Wire Grass	Too tough and wiry to be of much value for fodder
acuminata, R.Br.	Pointed Rice Grass	Similar to the two preceding grasses
Microlæna—		
stipoides, R.Br.	Weeping Grass	Excellent pasture grass for moist situations
Hierochloe—		
redolens, R.Br.	Scented Holy Grass	Of fair pasture value when young, but becomes harsh when old
rariflora, Hook. f.	Purple Holy Grass	About the same value as *H. redolens*
Aristida—		
arenaria, Gaudich.	Sand Spear Grass	All the species of this genus are only useful at an early period of their growth. When older, they become troublesome on account of their awns (three-pronged) with sharp points, which pierce the skins of sheep, and even their eyes if the wool around them is not clipped away
Behriana, F.v.M.	Behr Spear Grass	
leptopoda, Benth.	Slender Spear Grass	
vagans, Cav.	Wandering Spear Grass	
ramosa, R.Br.	*Branching Spear Grass*	
calycina, R.Br.	Dark Flowered Spear Grass	
Stipa—		
elegantissima, Labill.	Feather Spear Grass	All the species of this genus have a fair amount of pasture value when young; but, when older, develop spear-like awns, which pierce the skins of sheep, and cause considerable damage. They are also dangerous to the eyes of stock, and their presence in wool lowers its value
flavescens, Labill.	Pale Spear Grass	
teretifolia, Steud.	Round Leaved Spear Grass	
eremophila, Reader	Desert Spear Grass	
setacea, R.Br.	*Corkscrew Grass*	
Luehemanni, Reader	Cotton Spear Grass	
acrociliata, Reader	*Graceful Spear Grass*	
McAlpinei, Reader	Golden Flags	
Muelleri, Tate	Wiry Spear Grass	
semibarbata, R.Br.	Fibrous Spear Grass	
pubescens, R.Br.	Tall Spear Grass	
aristiglumis, F.v.M.	Bristly Spear Grass	
scabra, Lindl.	Rough Spear Grass	

VERNACULAR NAMES OF VICTORIAN PLANTS—*continued.*

Botanical Name.	Popular Name.	Use or Character.
MONOCOTYLEDONEÆ—ACALYCEÆ—HYPOGYNÆ—*continued.*		
GRAMINEÆ—*continued.*		
Dichelachne—		
crinita, Hook. f. ..	Long-hair Plume Grass ..	Useful for pasturage, also for hay
sciurea, Hook. f. ..	Short-hair Plume Grass ..	Useful grass, though not of the highest value
Pentapogon—		
Billardieri, R.Br. ..	Five-awned Spear Grass ..	Pasture grass, though not in the first rank
Echinopogon—		
ovatus, Beauv.	Hedgehog Grass ..	Harsh grass, usually found under shrubs and fences, and occasionally affords a bite to hungry stock when better grasses are not available
Amphipogon—		
strictus, R.Br.	Bearded Heads	Rather harsh grass; suitable for fodder when young
Pappophorum—		
nigricans, R.Br. (commune, F.v.M.)	Nigger Heads	Drought-resisting grass; not readily eaten by stock
Sporobolus—		
virginicus, Humb. and Kunth.	Virginian Rat-tail Grass ..	This grass has somewhat the habit of couch grass, and is valuable for saline situations
indicus, R.Br.	Indian Rat-tail Grass ..	When young, it affords a fair amount of pasturage, but becomes tough and wiry when older
Lindleyi, Benth. ..	Lindley Rat-tail Grass ..	This is one of the prettiest of our native grasses; also has fair pasture value
Agrostis—		
Muelleri, Benth. ..	Mueller Bent Grass ..	Valuable alpine pasture grass
scabra, Willd.	Rough Bent Grass ..	Good pasture grass; is also a good lawn grass, forming a dense turf
venusta, Trinius ..	Graceful Bent Grass ..	Of slight pasture value
Deyeuxia—		
Forsteri, Kunth. ..	Toothed Bent Grass ..	Useful winter grass
quadriseta, Benth. ..	Reed Bent Grass ..	Good fodder grass, especially for cattle
quadriseta, var. Montana, R.Br.	Mountain Bent Grass ..	Good fodder grass, especially for cattle
densa, F.v.M.	Dense Bent Grass ..	Of slight pasture value
minor, Benth.	Small Bent Grass ..	Of slight pasture value
frigida, F.v.M.	Alpine Bent Grass ..	Of slight pasture value
scabra, Benth.	Coarse Bent Grass ..	Of slight pasture value
nivalis, F.v.M.	Snowy Bent Grass ..	Alpine grass of fair pasture value
Deschampsia—		
cæspitosa (L.), Beauv. ..	Tufted Hair Grass ..	This perennial tussocky grass has not a high forage value
Trisetum—		
subspicatum, Palisot ..	Spiked Oat Grass ..	Perennial grass, found in most parts of the world, and has a good pasture value
Anisopogon—		
avenaceus, R.Br. ..	Oat Spear Grass ..	Usually found in poor sandstone country, and is sparsely tussocky; of slight fodder value
Danthonia—		
biparita, F.v.M. ..	Desert Wallaby Grass ..	Useful perennial pasture grass for arid localities
carphoides, F.v.M. ..	Small Wallaby Grass ..	Useful pasture grass, but not first class
penicillata, F.v.M. ..	Common Wallaby Grass ..	This variable grass, which has sometimes been separated into several species, is considered to be the best of our native grasses
robusta, F.v.M. ..	Ribbony Wallaby Grass ..	Usually found in alpine localities; valuable as a fodder grass
pauciflora, R.Br. ..	*Dwarf Wallaby Grass* ..	*Small alpine pasture grass*
nervosa, Hook. f. ..	Swamp Wallaby Grass ..	Tall grass; nutritious and palatable to stock
Cynodon—		
Dactylon, Pers. ..	Indian Couch Grass ..	Useful pasture grass; a good lawn grass, also for binding loose sand, but troublesome in gardens and cultivated land

Vernacular Names of Victorian Plants—*continued.*

Botanical Name.	Popular Name.	Use or Character.
	Monocotyledoneæ—Acalyceæ—Hypogynæ—*continued.*	
Gramineæ—continued.		
Chloris—		
aciculáris, Lindl. ..	Lesser Star Grass ..	Of fair pasture value
truncata, R.Br. ..	Windmill Grass ..	Good pasture grass, and stands drought well
Eleusine—		
cruciata, Lamarck ..	Finger Grass	Useful pasture grass
Poa—		
Labillardieri, Steud. ..	Blue Meadow Grass ..	Perennial rigid grass, of some value to saline meadows
cæspitosa, G. Forster ..	Tufted Meadow Grass ..	Valuable pasture grass, readily eaten by stock; *when tall, possibly of use for weaving*
nodosa, Nees.	Knotted Meadow Grass ..	Perennial; grows in almost pure sand. Produces tuberous enlargements at the roots. Nutritious fodder
lepida, F.v.M.	Scaly Meadow Grass ..	Of fair pasture value
Glyceria—		
Fordeana, F.v.M. ..	Sweet Swamp Grass ..	Useful fodder grass for moist situations
fluitans, R.Br.	Manna Grass	One of the best fodder grasses for very damp situations
stricta, Hook. f. ..	Quicksand Grass ..	Fair pasture value
dives, F.v.M.	Giant Mountain Grass ..	This tall mountain grass grows best in shady places on deep soil along rivulets, &c.
ramigera, F.v.M. ..	Bamboo Grass	Suitable for fodder when young; grows in swamps; its cane-like stems a useful for thatching
Festuca—		
duriuscula, L.	Hard Fescue	Grows well in hilly places, and is one of the best of the smaller fescues
littoralis, Labill. ..	*Coast Fescue*	*Good grass for binding drift sand on sea-shore*
Hookeriana, F.v.M. ..	Hooker Fescue	This tall perennial grass stands cold well, and is liked by stock
Diplachne—		
loliiformis, F.v.M. ..	Rye Beetle Grass ..	This small grass is eaten by sheep, but is *not of much value for fodder*
fusca, Palisot	Brown Beetle Grass ..	Suitable for damp situations; readily eaten by stock
Triodia—		
irritans, R.Br.	False Spinifex	Useful for fodder when young
Distichlis—		
maritima, Rafin. ..	Salt Grass	This dwarf creeping grass is of value for binding soil
Bromus—		
arenarius, *Labill.* ..	*Sand Brome*	*Though not of the first class, is a useful* fodder grass; does not stand drought
Eragrostis—		
tenella, Palisot	Delicate Love Grass ..	Though small, is a good pasture grass
pilosa, Palisot	Soft Love Grass ..	Abundant annual grass; readily eaten by stock
diandra, Steud.	Short Headed Love Grass	Fair pasture grass
Brownii, Nees.	Common Love Grass ..	*Valuable pasture grass; readily eaten by* stock
setifolia, Nees.	Bristly Love Grass ..	Useful for pasture when young, but becomes wiry when older
lacunaria, F.v.M. ..	Mallee Love Grass ..	Wiry grass of little value
falcata, Gaud.	Sickle Love Grass ..	Small grass, wiry in appearance; useful for pasture in arid districts
Elythrophorus—		
articulatus, Palisot ..	Spiky Grass	Handsome grass; of little value to the grazier
Trirhaphis—		
mollis, R.Br.	Needle Grass	Ornamental grass; of little value for pasturage

VERNACULAR NAMES OF VICTORIAN PLANTS—*continued.*

Botanical Name.	Popular Name.	Use or Character.
MONOCOTYLEDONEÆ—ACALYCEÆ—HYPOGYNÆ—*continued.*		
GRAMINEÆ—*continued.*		
Agropyrum—		
scabrum, Palisot ..	Common Wheat Grass ..	Rather harsh grass when in seed, but useful for fodder when young
velutinum, Nees. ..	Velvet Wheat Grass ..	Of little value as a fodder grass
pectinatum, Palisot ..	Comb Wheat Grass ..	Of fair fodder value when young
Arundo—		
Phragmites, L.	Common Reed	A tall, coarse, perennial grass, growing on the borders of ponds and streams. Not of much value for fodder. Useful for thatching
CONIFERÆ.		
Callitris—		
robusta, R.Br.	Murray Pine, or Marong ..	Wood obnoxious to white ants. Hard, heavy, light-coloured; fit for furniture and flooring
cupressiformis, Vent. ..	Cypress Pine	Its timber is not much used, and is light in weight as well as in colour
calcarata, R.Br. ..	Red Cypress Pine ..	Wood dark and ornamental; useful for wainscotting, panelling, &c., and is immune from termites
Podocarpus—		
alpinus, R.Br.	Alpine Podocarp ..	Grows in alpine situations; value of timber unknown

CRYPTOGAMÆ.

VASCULARES.

Botanical Name.	Popular Name.	Use or Character.
RHIZOSPERMÆ.		
Azolla—		
pinnata, R.Br.	Common Azolla ..	Troublesome weeds of ponds, shallow lakes, &c.
rubra, R.Br.	Red Azolla	Troublesome weeds of ponds, shallow lakes, &c.
Marsilea—		
quadrifolia, L.	Nardoo	The fruit is edible; forms part of the food of some of the aboriginal inland tribes
Pilularia—		
globulifera, L.	Creeping Pillwort ..	Has no pasture value
Isoetes—		
Drummondii, A. Braun ..	Quillwort	Plant of moist places; of no pasture value
LYCOPODINÆ.		
Psilotum—		
triquetrum, Swartz ..	*Skeleton Club Moss* ..	*Grows in rocky places, &c. Found also in Asia, Africa, and America*
Tmesipteris—		
Tannensis, Bernh. ..	Fern Club Moss.. ..	Grows on trunks of trees, ferns, in fern gullies, &c.
Lycopodium—		
Selago, L.	Fir Club Moss	
clavatum, L.	Common Club Moss ..	Yields Lycopodium powder
Carolinianum, L. ..	Spreading Club Moss ..	Capable of pot culture in greenhouses
laterale, R.Br.	Creeping Club Moss ..	Capable of pot culture in greenhouses
densum, Labill. ..	Mountain Club Moss ..	Capable of pot culture in greenhouses
scariosum, G. Forster ..	Alpine Club Moss ..	Capable of pot culture in greenhouses
Selaginella—		
Preissiana, Spring. ..	Preiss Club Moss ..	Capable of pot culture in greenhouses
uliginosa, Spring. ..	Swamp Club Moss ..	Capable of pot culture in greenhouses
Phylloglossum—		
Drummondii, Kunze ..	Drummond Club Moss	

Vernacular Names of Victorian Plants—*continued.*

Cryptogamæ—Vasculares—*continued.*

Botanical Name.	Popular Name.	Use or Character.
Filices.		
Ophioglossum—		
vulgatum, L.	Adder's Tongue ..	A large number of our native ferns are handsome decorative plants, which may be grown successfully in ferneries or green-houses. This applies to the two principal "Tree Ferns," namely, *Dicksonia antarctica* and *Alsophila australis*, which may be grown in the open garden if sheltered from winds and protected from too much exposure to the sun by the overhanging foliage of taller trees. The handsome "King-Fern" requires full shade and careful treatment. Various species of Adiantum, Lomaria, Davallia, Cheilanthes, *Asplenium*, *Aspidium*, and *Polypodium* are suitable for pot culture in green-houses, and can also be grown on the ground in shrubberies if well supplied with water. The "Filmy Ferns" (*Hymenophyllum*) require a continuously moist atmosphere, as well as shade, to be grown successfully, and, in the open, a hot north wind may kill them completely in an hour or two. Apart from their decorative use, none of our native ferns have any special economic value
Botrychium—		
Lunaria, Swartz ..	Common Moonwort ..	
ternatum, Swartz ..	Meadow Moonwort ..	
Schizæa—		
fistulosa, Lab.	*Comb Fern*	
bifida, Willd.	Forked Comb Fern ..	
Trichomanes—		
venosum, R.Br. ..	Bristle Fern	
humile, G. Forster ..	Short Bristle Fern ..	
Hymenophyllum—		
flabellatum, (Lab.) (H. nitens)	Shining Filmy Fern ..	
australe, Willd. (H. javanicum)	*Austral Filmy Fern* ..	
Tunbridgense, Smith ..	Tunbridge Filmy Fern ..	
Gleichenia—		
circinata, Swartz. ..	Coral Fern	
dicarpa, R.Br.	Wire Fern	
flabellata, R.Br. ..	Umbrella Fern	
Hermanni, R.Br. ..	Fan Fern (G. dichotoma, Hook.; G. linearis, Clarke)	
Todea—		
barbara (L.) Moore (Osmunda barbara, Thunb.)	*King Fern*	
Cyathea—		
medullaris, Swartz. ..	Black Tree Fern ..	
Cunninghami, Hook. f. ..	Slender Tree Fern ..	
Alsophila—		
australis, R.Br.	Prickly Tree Fern ..	
Dicksonia—		
antarctica, Lab. (D. Billardieri, F.v.M.)	Common Tree Fern ..	
davallioides, R.Br. ..	Creeping Dicksonia ..	
Davallia—		
pyxidata, Cav.	Hare's-foot Fern ..	
dubia, R.Br.	Rainbow Fern	
Lindsaya—		
linearis, Swartz. ..	Screw Fern	
trichomanioides, Dry. ..	Wiry Fern (Lindsaya cuneata (Forst.), Chr.)	
Adiantum—		
Æthiopicum, L. ..	*Common Maidenhair* ..	
formosum, R.Br. ..	Beautiful Maidenhair ..	
diaphanum, Blume. ..	Filmy Maidenhair ..	
hispidulum, Swartz. ..	Rough Maidenhair ..	
Notholæna (Cheilanthes)—		
Brownii, Desv. (vellea, R.Br.)	Downy Rock Fern ..	
distans, R.Br.	Bristly Rock Fern ..	
Cheilanthes—		
tenuifolia, Swartz. ..	Common Rock Fern ..	
Pteris—		
falcata, R.Br.	Sickle Fern (*Pellæa falcata* (R.Br.), Fee.)	
longifolia, L.	Long Sickle Fern ..	
umbrosa, R.Br. ..	Shady Brake Fern ..	
arguta, Aiton	Tender Bracken ..	
aquilina, L.	Common Bracken (Pteridium aquilinum (L.), Kuhn.)	Often takes possession of newly cleared land if neglected
incisa, Thunb.	Batswing Fern (*Histiopteris incisa* (Thunb.), J.Sm.)	See above remarks regarding native ferns
comans, G. Forster ..	Hairy Bracken	

* The nomenclature of the ferns for the whole world has lately undergone drastic revision. In nearly all cases, the new names are given in brackets after the popular name, since to make all the alterations in the present list would be too confusing for local botanists who have not yet had the *opportunity of acquiring the new names.*

VERNACULAR NAMES OF VICTORIAN PLANTS—*continued.*

Botanical Name.		Popular Name.	Use or Character.
		CRYPTOGAMÆ—VASCULARES—*continued.*	
FILICES—*continued.*			
Lomaria (Blechnum)—			
Patersoni, Spreng.	..	Strap Fern (B. Patersoni (R.Br.), Mett.)	
discolor, Willd. ..	..	Fishbone Fern (B. discolor (Forst.), Keys)	
lanceolata, Spreng.	..	Lance Fern (B. lanceolatum (R.Br.), Sturm.	
alpina, Spreng. ..	..	Alpine Lomaria (B. pennamarina (Poir.), Kuhn.)	
fluviatilis, Spreng.	..	Delicate Water Fern (B. fluviatile (R.Br.), Lowe)	
capensis, Willd.	..	Soft Water Fern (B. capense (L.), Schlecht.)	
capensis, var. procera	..	Rough Water Fern (B. capense (L.), Schlecht.)	
Blechnum—			
cartilagineum, Swartz.	..	Gristle Fern	
Doodia (Woodwardia)—			
aspera, R.Br. ..	..	Rasp Fern	
caudata (Cav.), R.Br.	..	Small Rasp Fern ..	
Asplenium—			
nidus, L. ..	..	Bird's-nest Fern ..	
Trichomanes, L.	..	Common Spleenwort ..	
flabellifolium, Cav.	..	Rat-tail Spleenwort ..	
Hookeranium, Colenso	..	Hooker Spleenwort ..	
præmorsum, Sw. (furcatum, Thunb.)		Forked Spleenwort ..	
obtusatum, Forst.†	..	Sea Spleenwort	
bulbiferum, G. Forst.	..	Mother Spleenwort ..	
umbrosum, J. Smith	..	Shady Spleenwort (Athyrium umbrosum (Ait.), Pr.)	
filix-femina, *Bernh.*	..	*Lady Fern*	
Cystopteris—			
fragilis, Bernh. ..	..	Brittle Bladder Fern ..	See remarks on previous page regarding native ferns.
Aspidium—			
molle, Swartz. ..	..	Soft Shield Fern (Dryopteris parasitica, L.)	
aculeatum, Swartz.	..	Cat-head Fern (Polystichum aculeatum (L.), Schott.)	
coriaceum, Swartz.	..	Leathery Shield Fern (Polystichum adiantiforme (*Forst.*), *J.Sm.*)	
decompositum, Spreng.	..	Shiny Shield Fern (Dryopteris decomposita (R.Br.), O.Ktze.)	
tenerum, Spreng.	..	Tender Shield Fern (Dryopteris tenera (R.Br.), C.Chr.)	
hispidum, Swartz.	..	Hairy Shield Fern (Polystichum hispidum (Sw.), J.Sm.)	
Polypodium—			
australe, Metten.	..	*Finger Fern*	
grammitidis, R.Br.	..	Gipsy Fern	
serpens, G. Forst.	..	Creeping Polypody ..	
pustulatum, G. Forst.	..	Spotted Polypody ..	
scandens, G. Forst.	..	Scented Polypody (P. pustulatum, Forst.)	
punctatum, Thunb.	..	Ground Polypody ..	
Hypolepis—			
tenuifolia, Bernh.	..	Soft Hypolepis	
Grammitis—			
rutæfolia, R.Br...	..	Common Rue Fern (Pleurosorus rutæfolius (R.Br.), Fee.)	
leptophylla, Swartz.	..	Delicate Rue Fern (Anogramma leptophylla (*L.*), *Link.*)	

† Given in Mueller's Census as *A. marinum, L.* This species is not recorded from Australia.

TOBACCO CULTURE.

(*Continued from page 394.*)

T. A. J. Smith, Tobacco Expert.

SHEDS FOR CURING.

The site for a tobacco shed should be chosen with a view to getting the advantage of the prevailing winds, when required. At the same time, a very exposed position is not desirable. A wet floor is to be avoided, and as tobacco sheds are not, as a rule, boarded, a dry site is essential. It is often possible to choose a site on the edge of a bank, which will prove convenient for cutting out for a furnace, or for making such an excavation as will allow a waggon to be backed in to save lifting in loading, &c.

For curing different types of tobacco differently constructed sheds will be necessary. For bright leaf, the shed should be small, as it is easier to get all the tobacco in the same condition in small quantities, and also to regulate the heat for the curing process. A square shed, 16 ft. x 16 ft., four tiers or floors high, will hold an acre of tobacco. The lowest tier should be 9 ft. from the ground, having poles 4 ins. in diameter, running from end to end. These should be 4 ft. apart on each floor. On these the sticks carrying the tobacco are hung. The next tier should be 3ft. 6in. above the first, and the third the same distance above the second. Two rows can also be hung in the roof. The walls should be closely made, with ventilators to open or shut round the bottom; and the roof should also be well ventilated to allow the moist air to be driven out freely. The whole building is best constructed of wood.

The heating apparatus may be an iron stove, with pipes running round inside the shed, at 5 ft. from the walls, and 1 ft. from the ground, the chimney pipe taking the smoke out through the roof or wall. Another means of heating is to have outside furnaces, with flues running along the floor of the shed; these are sometimes simply made by digging trenches through the floor, and covering with sheet-iron. Charcoal fires in tins will do the work in very small sheds.

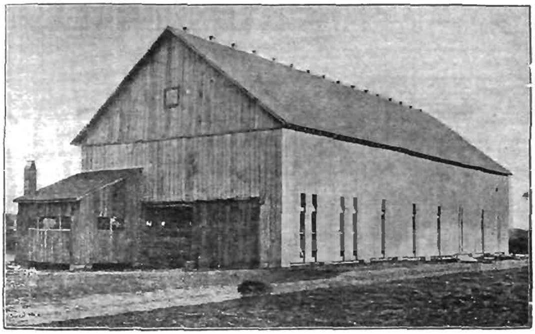
For heavy tobaccoes, larger sheds can be utilized, as the heat required is not so great. If the tobacco is to be partially air-cured, the shed should be built so that it can be freely opened or tightly closed. Where bush timber is available, a useful and cheap shed can be built on the following plan:—The corner-posts should be not less than 8 ins. at the small end, and 16 ft. apart each way in the square. They should be at least 4 ft. in the ground, and 16 ft. from the ground to the wall-plate. The first cross-beams should be let into the posts 9 ft. from the ground, and should not be less than 5 ins. in diameter at the small end, as the weight of the green tobacco that they will have to carry is considerable. On these, running the length of the room, poles are placed, 4 ft. apart. This will make the first floor. The next floor is made 3ft. 6in. above this, and the third floor the same distance above the second, bringing it level with the wall-plates. The roof should have plenty of pitch, and in this two more rows of tobacco can be hung on poles fastened to the rafters. The holding capacity will be about one acre, which, when cured, will vary from 800 lbs. to 1,500 lbs.

A skillion, 12 ft. wide and 12ft. 6in. high on each side, will add to the carrying capacity of the shed, and be an additional support against

the wind. The sides can be made of paling or weatherboard; where bark is obtainable it will suffice. Shutters or ventilators should be all round the building, to enable the air to circulate freely throughout when desired, and the roof should be well ventilated. Such a shed can be extended to three rooms, that is, 48 ft., but longer than this is not advisable.

A very good shed in the north-east of Victoria is built of bush timber, with Gippsland paling roof, and paling shutters for sides. The dimensions are 36 ft. by 40 ft., including skillions, and the capacity is sufficient for 4 acres of tobacco. The cost is just under £30, labour and material included.

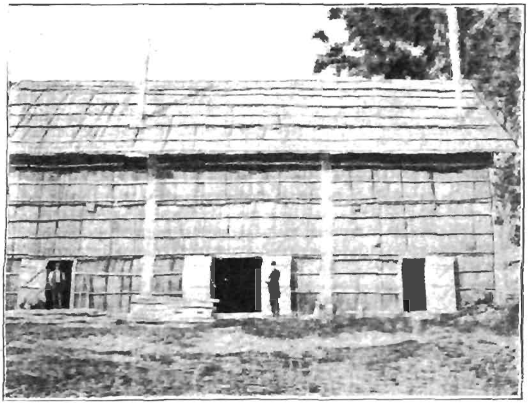
The majority of sheds in use at the present time are unsuited to the cure of good tobacco, but could be made effective with a little additional trouble. The custom has been to build long, narrow sheds, with sides imperfectly closed, with bark or rushes to the height of the first floor. The intermediate space between this floor and the eaves is enclosed with cheap



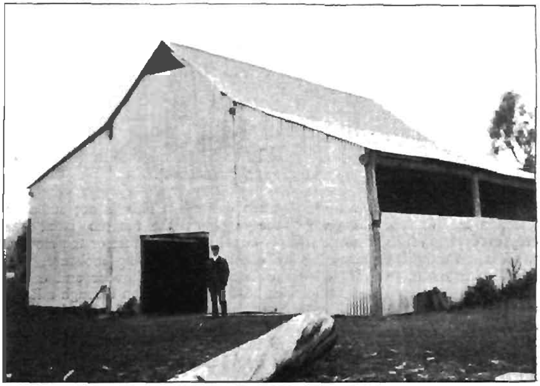
MODERN CURING SHED (AMERICAN).

hessian, which is raised or lowered when desired. This is not sufficient protection against the changes of the weather; the tobacco is at the mercy of drying winds or wet spells, is cured either too fast or too slowly, and is often ruined after curing by constantly absorbing moisture, and again drying out with every change of atmosphere. Flavour and colour are lost, and in many cases the tobacco becomes half rotten through mildew on a great part of the leaf. A large proportion of Victorian leaf reaches the market in this damaged condition, and the reputation of the local tobaccoes suffers very greatly owing to this fault. The cost of the shed is not a very large item, and where it is found necessary to economize, well-built bark sides and roof will answer well. Thatch sides and roof will also make fair sheds, if made close and thick; the chief objection to these is the danger of fire.

Iron roofs are objectionable, unless very steep, or material is used to catch the drip caused when frosts melt, the tobacco being injured by contact with water even in such small quantities. Tobacco is not in the shed



TOBACCO BARN BUILT OF BUSH TIMBER AND STRINGY BARK.
This shed is not sufficiently provided with ventilators.



BUSH TIMBER AND IRON SHED AT WHITFIELD.

for the whole year, and the building will be found very useful for many other purposes, making a valuable asset on the farm.

(*To be continued.*)

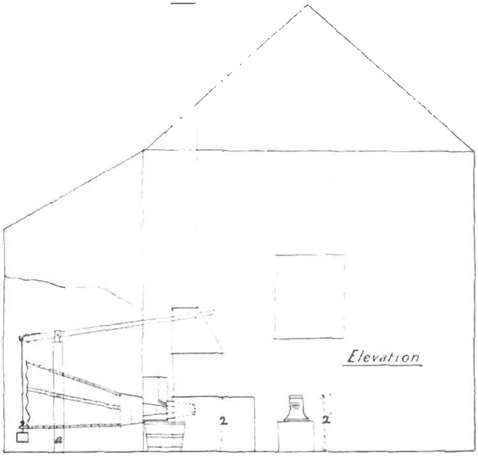
FARM BLACKSMITHING.

(Continued from page 482.)

George Baxter, Instructor in Blacksmithing, Working Men's College, Melbourne.

II.—FITTING-UP WORKSHOP.

The accompanying drawings will convey a general idea of the internal arrangement of a suitable workshop. It may, however, be varied to suit existing conditions—for instance, an available shed, in which the door and windows are in different positions, could be utilized. There is no mathematical precision requisite in the building or laying out of a



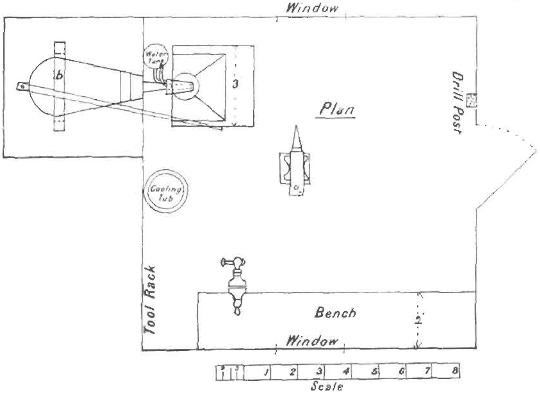
4. INTERNAL ARRANGEMENT OF WORKSHOP.

blacksmith's shop. In this case it is assumed that no building exists; and, with the object of saving as much expense as possible, the dimensions have been kept as small as the nature of the work will conveniently permit.

The bench is intended to be used for carpentry and plumbing, as well as for ironwork. A blacksmith's vice, fixed in the position indicated, can be used for wood-work as well as iron; or a carpenter's vice can be attached to the other end. A couple of drawers for holding various tools may be fitted beneath the bench.

Drilling.

It will be necessary to have some means of drilling holes. There are three methods that may be adopted. The first and best is to buy a small machine (Fig. 6), costing from 35s. upwards. It is simply bolted on to a strong post. The second method is by means of a ratchet-braes. To fit up the ratchet, two strong right-angled brackets are required to be made and fixed to the post with coach-screws, as shown in Fig. 7, or to a drill post (Fig. 8), which may be fastened to the bench. The third way is by means of a "swing-braes," which is a very common home-made affair. It consists of a top and bottom bracket, the same as that shown for the ratchet, except that a hole is drilled and tapped close to the end of the top bracket, in order to take a bolt for the purpose of applying pressure to the drill as it cuts its way through the metal The swing is



5. Ground Plan of Workshop.

made from about 1¼ in. diameter mild-steel or iron. It has a square-tapered hole punched longitudinally in one end, for the reception of the drill, and a centre made in the other end to receive the bolt which applies the pressure to the drill. Fig. 6 shows the arrangement.

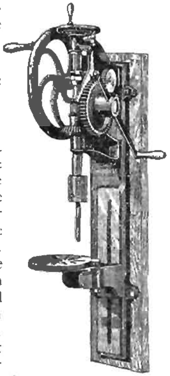
The forging of the brackets and swing-braes requires considerable blacksmithing skill; so, under the circumstances, it would be advisable to purchase the finished machine. It drills more quickly and accurately; it also requires less labour, and is so easy to operate that no special instruction is necessary. It is therefore not proposed to more fully describe the making of the various parts required for the other methods at the present juncture. But, later on, as progress is made with the use of the tools, and some may desire to try their hand at making a swing-braes, the details will be furnished.

Building the Forge.

Let it be supposed that the shop is now built, and that it is decided to adopt the bellows principle of forge construction, similar to that illus-

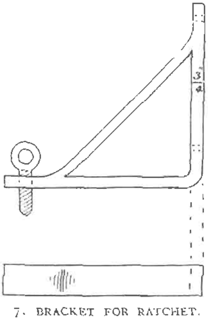
trated. The style shown is of the usual pattern; but, at the same time, it is more elaborate than a great many to be seen in the country districts. It will no doubt present many difficulties to the amateur in the matter of construction. This is admitted, but the object is to present a complete design of forge; but any one who chooses to leave out a part will, of course, be at liberty to do so.

It was previously stated that a forge could be constructed of iron, hardwood, bricks or stone. That shown in Fig. 4 is built of iron, which is undoubtedly the best. The cost would be about £8 complete. If an old tank were available it could be adapted as described further on. The most difficult part of its conversion into a forge would be making the hood and chimney. There are many instances of fires without a hood or chimney, and in which good work is done. At the same time they are not so comfortable to work at, for the reason that the heat, dust, and smoke have no proper outlet. If wood-work is to be done in the same shop, the forge should have the hood and chimney attached; but it need not be made such an obstacle as to prevent the farmer from having a forge. If the cost of getting a good iron forge built be prohibitive, use the available material, sooner than be without one.

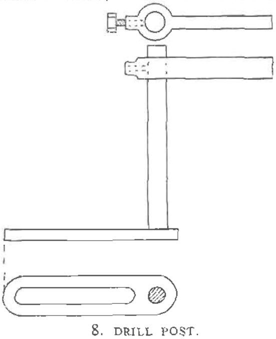


6. DRILLING MACHINE

An old square tank may be converted into a forge, similar to that shown in the drawing, without a great deal of trouble, provided one is equipped with a cold-chisel and hammer. First, cut out as shown in



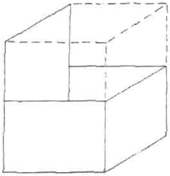
7. BRACKET FOR RATCHET.



8. DRILL POST.

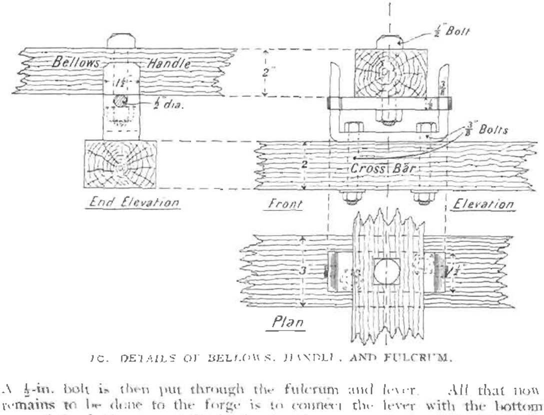
Fig. 9. The piece left on one side will form the back of the forge to which the hood can be attached, if one is desired. To complete it similarly to that illustrated, the hood and chimney would require to be made

of sheet iron riveted together and afterwards fastened to the back by means of bolts or rivets. Next, cut out a round hole in the back to admit the tue-iron (see page 482). The position of the centre of the hole should be 4 in. below the top of the hearth, and the diameter of the hole should be equal to that of the tue-iron, measured 8 in. from its smaller end. The next step of importance is to fix the bellows, which is not by any means a difficult operation. Two strutted posts (See *a*, Fig. 4), standing about 4 ft. high from the floor, are placed at a distance apart equal to the width of the bellows, the cross piece (See *b*, Fig. 5) being securely fastened to the top of the posts. The longitudinal position of the posts is found by pushing the nozzle of the bellows as far into the tue-iron as possible, and noting the position of the bearing pins attached to the bellows.



9. IRON TANK CONVERTED INTO FORGE.

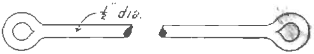
The lever for operating the bellows is made from a piece of 3 in. x. 2 in. hardwood. The length should be suitable to the size of bellows, and it should be tapered towards the handle and rounded off to suit the hand. To attach the lever get the nearest blacksmith to make the forging shown in Fig. 10. There should not be any difficulty about getting this made as all the dimensions are given. When finished, get two bolts, $\frac{3}{8}$ in. diameter, and long enough to pass through the ironwork and crossbar with a washer and nut, and screw on beneath.



10. DETAILS OF BELLOWS, HANDLE, AND FULCRUM.

A ½-in. bolt is then put through the fulcrum and lever. All that now remains to be done to the forge is to connect the lever with the bottom flap of the bellows, and fill in the hearth with earth to the level of the top, excepting immediately in front of the tue-iron, which should be left for fuel. The connecting rod can be attached to the lever in several

ways; about the simplest and, at the same time, effective arrangement is that shown in Fig. 11.



11. CONNECTING ROD.

FIXING THE ANVIL.

To fix the anvil in position a hardwood block, 2 ft. long and about 1 ft. square or round, is sunk into the ground to such a depth that the anvil, when placed on top, will be standing 2 ft. above the floor level. The relative position of the anvil to the fire is shown in Fig. 5.

There are several methods of fastening the anvil to the block, the simplest being to make four spikes about 6 in. long and ⅜ in. or ½ in. diameter, and drive them into the block in the positions indicated in the drawing.

COOLING TUB.

It is essential to have water close to the fire as it must be repeatedly sprinkled when coal is used as fuel, to prevent the fire from spreading, and to quench the flame which arises when fresh coal is added. Water is also wanted for cooling the iron, and for tempering steel.

(To be continued.)

MILLIPEDES DESTROYING VEGETABLES.

C. French, Jun., Acting Government Entomologist.

During the last few months vegetable growers have complained about losses caused through what they describe as "small, white, worm-like insects." Specimens were sent to this Branch for examination and report as to the best means for their suppression. On examining the soil taken from around cabbages, cauliflowers, parsnips, potatoes, and other vegetables, millipedes could be seen in great numbers.

Millipedes belong to the order known as *Myriopoda*. They are of a dirty white colour, measure about ½ inch, and have two pairs of legs on each segment of the body.

The following remedies have proved very effectual:—

Arsenate of Lead.—Spray a few vegetable leaves with arsenate of lead. These should be dug into the soil, and renewed from time to time.

Benzole Emulsion.—This is a cheap preparation, the cost being about 8d. per 1-lb. tin (1 lb. makes five gallons). The ground should be thoroughly watered with an ordinary watering can; there is no danger of injury to the plants.

They may also be trapped. Place scooped-out turnips or potatoes in the ground overnight, remove them each morning and dip in boiling water.

DYSENTERY IN BEES AND NOSEMA APIS.

F. R. Beuhne, Bee Expert.

Since the publication of the articles on Bee Mortality in the *Journal* for January, 1910, which reported the presence in Victorian bees of the Nosema parasite discovered by Dr. Zander, bee-keepers have looked upon this parasite as a serious menace to the bee-keeping industry. I refer to those bee-keepers who assumed that the abnormal losses of bees in the Grampians country in the spring of 1909 were caused by Nosema apis.

The microscopical examinations of bees from all parts of Victoria, made by Mr. W. Laidlaw, B.Sc., Biologist of the Department of Agriculture, during the past twelve months, show that Nosema apis is present in some bees in nearly every apiary, even in localities where losses have never occurred, and where colonies are in a prosperous and highly productive condition.

This reassuring outlook is further strengthened by an article in the *Münchener Bienen Zeitung* of May, 1911, by Dr. Walter Hein, of the Biological Experiment Station at Munich. After recapitulating Dr. Zander's theory of Nosema apis, Dr. Hein says:—

> Dr. Zander's theory created much stir; and, in view of the far-reaching consequences which he indicated as being proved by observations and experiments, it appears desirable to review the Nosema question in the light of scientific observations and experiments made by others.

In March, 1910, Dr. A. Maassen, of the Imperial Biological Institute, published the following results of some interesting experiments:—

> A colony of bees experimentally infected did not show Nosema spores in the excrements voided a fortnight later, and only a month later was the parasite found in the chyle stomach of the bees, and still later in the excreta.
>
> Two other experimental stocks appeared quite healthy four weeks after infection. In six weeks, parasites were observed; and, even after eight weeks, there were no distinct symptoms of dysentery, although by now the parasite could be found in most of the bees. One of these colonies did not show any symptoms till three months had passed.

Dr. Maassen states that it is probable that the Nosema parasite will be found in limited numbers in bees without causing a noticeable interference with the health of the colonies, and that Nosema only becomes dangerous when adverse conditions lower the vitality of the bees.

In a publication of more recent date (March, 1911) Dr. Maassen gives the results of later experiments which in many respects contradict those of Dr. Zander.

> The distribution of Nosema apis is so great that there are perhaps only a few apiaries in Germany where all colonies are absolutely clean. Even in only mildly affected colonies, odd bees contained the parasite in enormous numbers. Badly infected bees live remarkably long and remain active.

In autumn, 1909, Dr. Maassen wintered thirty colonies which showed a high degree of infection. In spring, three of the colonies showed symptoms of dysentery; two, heavy losses in bees; and one had died of starvation. The remaining stocks wintered well and built up normally, while even those with symptoms recovered. In all the colonies the parasite could always easily be found. In some of the hives "May Sickness" suddenly appeared without, however, doing much injury to them. The bees examined showed enormous numbers of Nosema spores, but even these colonies recovered and behaved exactly the same as perfectly healthy

ones, during the summer, notwithstanding that Nosema-infected bees could always be found; only newly hatched bees were in every instance free from the parasite.

Dr. Maassen's experiments throw considerable doubt on the correctness of Dr. Zander's view of the devastation resulting from Nosema apis. The twenty-four badly infected stocks which wintered and built up well should at least have shown large numbers of dead bees; but they did not, and only 10 per cent. of the infected colonies showed symptoms, and even these recovered.

After recounting a similar case which occurred in Bavaria, Dr. Hein proceeds:—

Other instances could be given of colonies in which Nosema was proved to be present to a considerable degree at the beginning of winter without any noticeable detrimental consequences resulting in spring. There was no dysentery and no mortality of large numbers of bees. In dealing here briefly with the Nosema pest, as described by Dr. Zander, I cannot accept his repeated contention: "The diseased bees are hopelessly doomed."

Amongst the lower animals, quite a number of parasites are known which may be found in the majority of the individuals of a species in very large numbers, and yet cannot be considered as disease-producing, except in rare instances. We also know of animals which are inhabited at the same time by a number of harmless parasites which are not considered disease-producing. But when such a parasite-infested animal becomes weakened by starvation, cold, poor nourishment or disease, then these parasites multiply rapidly and hasten death. They therefore can only be looked upon as a secondary or contributing cause.

The proof that Nosema always causes dysentery, and the destruction of the affected bees, is entirely wanting. The few experiments made by Dr. Zander are insufficient; this is proved by Dr. Maassen's experiments. The assumption that May disease is caused by Nosema apis also lacks experimental proof. Even though the parasite is regularly found in great numbers in bees affected with May disease, its connexion with it, as the cause, must be proved by conclusive experiments before it can be accepted.

From the point of view of Nosema apis, adopted by Dr. Zander, his advice for combating the disease is totally inadequate. If the Nosema parasite is, as Dr. Zander assumes, the primary cause of the disease, the remedies recommended by him (except destruction by fire) can only result in maintaining the source of infection, instead of removing it. By transferring to clean hives, re-queening, and removal of combs, the diseased bees are kept alive, and after a few hours or days again cause infection of their new surroundings.

The present aspect of the question is that Nosema apis is a frequent inhabitant of bees, and should certainly not be treated with indifference. But, to consider the parasite as the primary cause of dysentery, as Dr. Zander does, is not justifiable at present. Nosema is present in apiaries; and, with bees weakened by adverse conditions or irrational management, it may get the upper hand through the bees losing their resistance to the parasite. The experiments of Dr. Maassen and others demonstrate that a good strong colony of bees can harbour the parasite for a long time, without loss of vigour and productiveness. With natural, cleanly and rational treatment, it should not be too difficult to maintain colonies in such a condition that they are able to resist the apparently unavoidable Nosema parasite.

INSECTIVOROUS BIRDS OF VICTORIA.

White-throated Tree Creeper (*Climacteris leucophæa*, Latham).

C. French, Jun., Acting Government Entomologist.

The White-throated Tree Creeper is one of our most useful insect-destroying birds, and is fairly plentiful in many parts of the State. I have seen specimens at the Mornington Peninsula, Werribee Gorge, Melton, and other places.

Like other species of Tree Creepers, it has the peculiar habit of ascending trees in a kind of spiral course by a series of short hops or jumps, and disappearing and re-appearing every few seconds; all the while searching for insects in the crevices of the trees.

A correspondent in Gippsland writes that he regards this as one of the best insect-destroying birds in the district. He has frequently noticed it working its way round and round apple and pear trees in search of the grubs and chrysalides of the codlin moth and other injurious insects which form its chief food.

This species is easily distinguished from the Brown Tree Creeper, which is also a very useful bird, by its white throat: the centre of the abdomen is also white, while the coat is greyish brown.

The female is almost similar in colour to the male, with the exception that it has a small patch of orange-coloured feathers below the ear coverts.

The White-throated Tree Creeper builds its nest in the hollow branch of a tree, usually a dead one. The nest is generally composed of fine pieces of bark, grasses, &c., and it is lined with feathers and rabbit or opossum fur. As a rule, the clutch of eggs consists of three, of a dull white colour, with spots of reddish-brown. The dimensions of the egg are:—Length, 0.8 inch; breadth, 0.65 inch. The breeding time is from the middle of August to December.

In addition to Victoria, the White-throated Tree Creeper is found in New South Wales, Queensland, and South Australia. The accompanying plate will enable readers to easily identify it. It is scarcely necessary to add that this bird deserves every protection from fruit-growers and others engaged in rural pursuits.

L. C. Vald Andersen, Del. C. French, Jun., Direxit. Osboldstone & Co., Print.

WHITE-THROATED TREE CREEPER.

(Climacteris leucophœa, Latham.)

EXPERIMENTAL FORAGE PLOTS, 1910–11.

T. A. J. Smith, Chief Field Officer.

Maize.

For convenience and information as to the varieties suited to different districts, the maize plots have been divided into three areas, viz., Northern and Central, Southern, and Western. All the plots were sown with the same weights of seed and manures, that of seed being 28 lbs. per acre, and the manure 1 cwt. superphosphate and ½ cwt. sulphate of ammonia per acre. It is necessary to mention that some of the plots were partially destroyed by rabbits, and in another instance stock had been turned on before some of the later varieties had time to fully mature. On one plot, the maize had been cut and used for green feed; though the approximate weights were taken by the owner, they are not taken into account in the averages, as only those plots weighed by an officer of the Department can be considered, in order to secure uniform calculations.

Northern and Central.—The plots that did best were at Pootilla, Swan Hill, Ballarat, and Bacchus Marsh. Yellow Moruya and Sydney Flat Red gave an average return of 16½ tons per acre from seventeen plots. At Pootilla, in a rich red loam, Yellow Moruya returned 25½ tons per acre. Boone County Special and Blood Red came next, with an average of 15 tons for the same number of fields. Owing to its small seeds, Blood Red was sown very much thicker than any of the other varieties. If this maize were sown the same distance apart as the others, I think that it would yield very heavily, especially as a very noticeable feature about it was the number of cobs that each plant grew in comparison with those alongside it. Goldmine gave an average return of 13¾ tons, and Eclipse and Hickory King, 13 and 12¾ tons respectively.

Southern.—In the Southern area, Yellow Moruya again leads with an average yield of 16½ tons per acre from eight plots. In the Alberton plot this variety returned 32½ tons per acre, Sydney Flat Red coming next with 15½ tons. Farmers all speak very highly of Sydney Flat Red and Blood Red, as they are not so coarse as Yellow Moruya and Hickory King. Eclipse, for the same number of plots, gave an average return of 15¼ tons. Boone County Special, 13; Goldmine, 12½; Hickory King, 11; and Blood Red, 10 tons per acre, complete the list of varieties sown in the Southern experimental fields. These figures do not do the best crops justice, as two of the plots were waterlogged for a considerable period, thus bringing the averages down considerably.

Western.—In the Western area, the averages are lower again than in either of the other two. Eclipse is the only maize that shows an improvement. It leads with an average weight of 16¾ tons per acre for seven fields, Yellow Moruya coming next with 14½ tons for the same number. The remaining varieties follow in the following order:—Hickory King and Boone County Special, 10½ tons; Sydney Flat Red, 10 tons; Blood Red, 9¾ tons; and Goldmine, 8¼ tons.

The sample of Hickory King seed was not the best. Owing to its having been kiln-dried, a large percentage of the germs had been burnt, and naturally a poor germination followed.

In some cases, the farmers had taken an intelligent interest in the crop, and had worked the ground well and kept it in splendid condition; while others did not give the plots the attention required to give them a fair chance.

Fertilizers.—The fertilizers used—superphosphate and sulphate of ammonia—might be varied in future to suit different soils and climates, with better effect. In districts with a low rainfall, and in soils containing a small amount of lime, blood and bone manure applied with the first fallow for these crops would probably be more effective. While, on soils containing lime in fair quantity, the superphosphate and sulphate of ammonia will have good effect.

Varieties.—Yellow Moruya was much later in ripening than the other varieties, keeping green right up to the last, the cobs not maturing properly. The stalk was large and coarse and when cut for green fodder was not relished by the stock to the same extent as Blood Red, Sydney Flat Red, and Goldmine. It is therefore a good maize to grow for silage on account of its heavy yielding capacity and proclivity for keeping green, especially in the Northern districts.

HICKORY KING AND YELLOW MORUYA MAIZE AT YARRA GLEN.

Practically the same remarks apply to Hickory King. The large stalks make it difficult for cattle to eat it, unless converted into silage. It is also a late ripener.

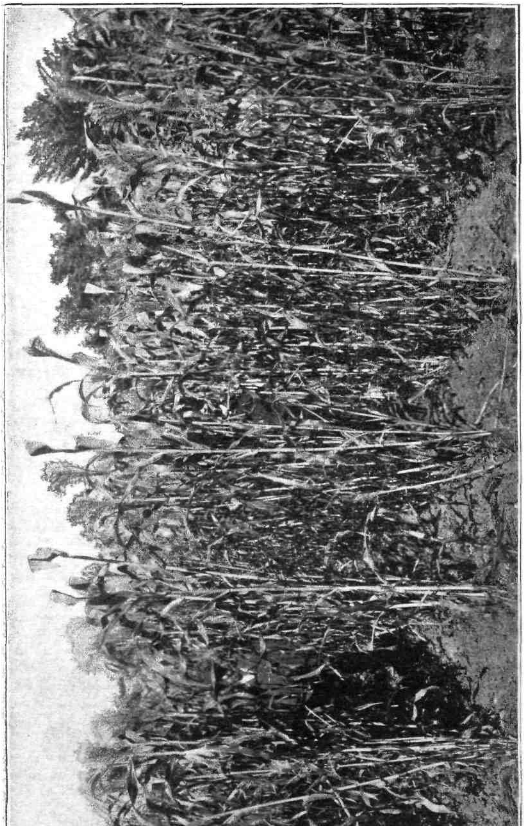
Blood Red is a fairly early ripener and cobs well. It has given satisfaction when cut for green fodder for cattle.

Sydney Flat Red and Goldmine are next in order, both as regards early maturity and green fodder.

Eclipse keeps green right up to the end of the season, has a fine long stalk, is a fair cob-bearer, and is good as a green fodder and for silage purposes. In early dry districts it appears to stand drought better than the others and is an easy variety to handle for cutting into silage.

SOJA BEANS.

The Soja Beans, with two exceptions, did badly, but in nearly every place the heavy rains precluded any chance of their doing well. At Cheltenham, they gave a return of 12 tons of green fodder per acre, and at Smythe's-road, Ballarat, 10 tons per acre.



CROP OF BROOM CORN AT GEELONG.

Millets.

Millets were only sown in one plot—at Ballarat. Japanese gave a return of $7\frac{3}{4}$ tons; and French White, 6 tons per acre.

Broom Corn.

At Geelong, two varieties of Broom Corn were sown, and were splendid samples, being $9\frac{1}{2}$ feet in height; the weights per acre were—Californian, $6\frac{1}{2}$ tons; Italian, $3\frac{3}{4}$ tons.

Broom Corn, though not so good a fodder, makes silage practically equal to maize on analysis, and can be grown where maize is doubtful, being hardier and requiring less moisture. It is necessary, however, to have paddocks well fenced, as stock are very liable to get "blown" if they get access to this crop in the early stages of growth up to the seeding period.

Broom Corn can also be grown for the panicles, which yield about 7 cwt. per acre, and are worth on an average £25 per ton; these are cut on the green side and the stalk can afterwards be made into silage.

THE ARTIFICIAL MANURES ACTS.

UNIT VALUES FOR 1911.

P. R. Scott, Chemist for Agriculture.

Since the publication of the last unit values of manures, the principal Act, No. 1930, of 1904, has been amended in many important directions, and the short amending Act of 1905 has been entirely repealed. Experience in the administration of the old Acts disclosed certain weak points and cumbersome requirements, and while these have been remedied and simplified for the more effective administration of the law, the protection to the farmers and others interested has in no way been diminished.

Requirements of the Amended Acts.

In lieu of the necessity which existed under the old Acts for manufacturers, importers, and vendors to submit representative samples of manures for analysis, a system has been substituted whereby manufacturers or importers are required, on or before 1st November in each year, to register the brands of their several fertilizers, and at the same time supply to the Secretary for Agriculture, under declaration, the name and address of manufacturer or importer, the place of manufacture, the raw material from which the manure is manufactured or prepared, a statement of the

percentages of plant foods contained in the manures, and the retail price per ton. From these percentages and prices, the unit values of the constituents, which have a commercial value, are calculated, and this unit value constitutes the basis for calculating the values of all manures for the period during which the registered brands continue in force.

Another important amendment is the introduction of a schedule fixing a definite limit of deficiency allowable in all fertilizers. When any manure is shown to contain less nitrogen, phosphoric acid, or potash than the proportions stated on the label or in the invoice certificate, to the extent set forth in the schedule, the vendor is liable to a fine of £10 for a first offence, and £50 for any subsequent offence.

SCHEDULE.

Description of Manure.	Percentages of Deficiency allowed in regard to Ingredients of Fertilizing Value.				
	Nitrogen.	Potash readily Soluble.	Phosphoric Acid.		
			Water Soluble.	Citrate Soluble.	Citrate Insoluble.
All manures containing nitrogen ..	0·50				
All manures containing potash ..	..	1·00			
All manures containing water soluble phosphoric acid ..	..	..	1·00*		
All manures containing citrate soluble phosphoric acid ..	..	..	..	1·00*	
All manure containing citrate insoluble phosphoric acid ..	..	..	..	..	1·00*

* NOTE.—Provided that the total phosphoric acid deficiency shall not exceed 1·50 per cent.

Amongst the important sections of the old Act which have not been repealed are Nos. 5 and 7. These clauses require the vendor to attach to each bag a label or tag, declaring the composition of the manure sold in quantities exceeding 56 lbs., and to deliver to all purchasers of manures at or before the time of sale an invoice certificate conveying similar information to that required to be stated on the label.

PRACTICAL UTILITY OF UNIT VALUE SYSTEM.

From the unit values and the guarantee contained on the tags or invoice certificates, any purchaser of manure is enabled to ascertain if the price asked for a manure is its reasonable commercial value.

It should be borne in mind that in buying a fertilizer at a stated price per ton the purchaser is buying so many pounds of plant foods according to guarantee, and it does not necessarily follow that the manure for which the lowest price per ton is asked is the cheapest one to purchase.

Low grade manures are generally expensive in the long run, when the cost of handling, transport, and other expenses are taken into consideration. It will be noted that the price asked for mixed manures is generally higher than the commercial value which would be arrived at by means of a calculation from the unit value, but it must be remembered that in fixing the unit values no allowance is made for the cost of mixing and other incidental expenses, but only the actual value of the constituents which have a commercial value is taken into account.

The unit values and methods of calculation are shown hereunder :—

Unit Values of Manures for 1911.

(Calculated from the declared prices of Fertilizers registered at the Office of Secretary for Agriculture.)

	£	s.	d.
1 per cent. of nitrogen in the form of nitrate	0	17	4
1 .. nitrogen in the form of ammonia	0	14	9
1 .. nitrogen in the form of blood	0	13	6
1 .. nitrogen in bonedusts, bone fertilizers, or animal fertilizers ..	0	12	0
1 .. water soluble phosphoric acid	0	4	8
1 .. citrate soluble phosphoric acid	0	4	0
1 .. phosphoric acid in fine bone	0	4	0
1 .. insoluble phosphoric acid in superphosphates, nitro-superphosphates, ground phosphates, and guanos	0	2	0
1 .. insoluble phosphoric acid in mixed manures, Thomas phosphate, bone fertilizers, and in coarse bone	0	3	0
1 .. potash in the form of chloride	0	4	6
1 .. potash in the form of sulphate	0	5	6

Method of Calculating the Commercial Value of a Manure.

The commercial value per ton of a manure sold in Victoria is obtained by multiplying the percentages stated of the fertilizing substances by the corresponding unit values fixed therefor and adding the separate values together. Examples :—

1. *Nitrate of Soda. Invoice certificate or tag, 15.50 per cent.*

	£	s.	d.
Calculation—15·50 × 17s. 4d. = ...	13	8	8
Calculated value per ton = ...	13	8	8

2. *Superphosphate. Invoice certificate or tag* :—

Water soluble phosphoric acid	17 per cent.
Citrate soluble phosphoric acid	1 ..
Insoluble phosphoric acid	2 ..
Total phosphoric acid	20 ..

	£	s.	d.
Phosphoric acid (water soluble)—17 × 4s. 8d. = ...	3	19	4
.. .. (citrate soluble)—1 × 4s. = ...	0	4	0
.. .. (insoluble)—2 × 2s. = ...	0	4	0
Calculated value per ton	4	7	4

3. *Bonedust. Invoice certificate or tag* :—

Nitrogen	3·50 per cent.
Phosphoric acid	19·50 ,,
Mechanical condition :—	
Fine	40 per cent.
Coarse	60 ,,

	£	s.	d.
Nitrogen—3·5 × 12s.	2	2	0
Phosphoric acid, fine— $\frac{19 \cdot 50 \times 40}{100} = 7 \cdot 80 \times 4s.$ ..	1	11	2
Phosphoric acid, coarse— $\frac{19 \cdot 50 \times 60}{100} = 11 \cdot 70 \times 3s.$ ..	1	15	1
Total value per ton	5	8	3

4. *Mixed Manure. Invoice certificate or tag :—*

Nitrogen as sulphate of ammonia	..	..	1·60 per cent.
Phosphoric acid—			
Water soluble	..	..	11·50 per cent.
Citrate soluble	..	..	·65 ,,
Citrate insoluble	..	..	1·25 ,,
Potash as muriate (chloride)	..	..	1·50 ,,

Calculation—	£	s.	d.
1·60 × 14s. 9d. = ..	1	3	7
11·50 × 4s. 8d. = ..	2	13	8
·65 × 4s. = ..	0	2	7
1·25 × 3s. = ..	0	3	9
1·50 × 4s. 6d. = ..	0	6	9
Calculated value per ton ..	4	10	4

GENERAL REMARKS.

All substances containing nitrogen, phosphoric acid, or potash, manufactured or prepared for the purpose of fertilizing the soil or supplying nutriment to plants, come under the operation of the Artificial Manures Acts. As regards nitrogen, we find the chief supply in three different chemical forms, namely, nitrate, ammonia, and organic. In the nitrate state it is combined with sodium, forming nitrate of soda, which is readily soluble in water, and is in a condition immediately available for plant nutrition. As ammonia, it combines with an acid radicle, forming sulphate of ammonia, which is also soluble in water, but is not so readily assimilated by the plant as the nitrate, and its action is consequently slower in effect. In the organic form, nitrogen is found in dried blood, bonedusts, and other organic substances. In this state, it is insoluble in water, and therefore slowest in action, but it is not so liable to loss by seepage as the two first-mentioned forms. In addition to the above-named substances, new materials possessing nitrogenous properties are being introduced, such as nitrate of lime and cyanamide of calcium; both of these contain lime as a base, and are likely to be of considerable value as fertilizers in the future.

Phosphoric acid appears under three headings (water soluble, citrate soluble, and insoluble), and these terms express the forms in which phosphoric acid is readily available, moderately so, or difficultly so, respectively. The first-mentioned form is, of course, soluble in water, the second is the portion soluble in citrate of ammonia after the extraction of the water soluble content. Citrate soluble form is generally considered to be available as plant food, and is of importance in arriving at the value of a fertilizer. The insoluble phosphoric acid is not of any immediate value to the plant, its action on soils is slow, and its use doubtful. Experience has shown the necessity of fertilizers, which are immediately available to the plant, and for this reason insoluble phosphate is treated with sulphuric acid, and so converted into soluble superphosphate.

In bonedusts, bone fertilizers, and mixed manures, there is a considerable and varying proportion of phosphoric acid in the insoluble state.

In Thomas phosphate, the phosphoric acid is contained in an available form. It possesses also a small percentage of free lime, and has qualities quite distinct from ordinary superphosphate, which is more readily soluble.

In all potash fertilizers the potash is of a uniform, readily available, character.

Appended is a list of all fertilizers registered in the office of the Secretary for Agriculture for the year 1911, showing the particulars of each manure, as required by the Act to be published in the *Government Gazette*.

List of Fertilizers Registered at the Office of Secretary for Agriculture under the Artificial Manures Acts.

Description of Manure.	Brand.	Nitrogen.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. In-soluble.	Phosphoric Acid. Total.	Price asked for the Manure per Ton.	Where obtainable.
		%	%	%	%	%	£ s. d.	
Concentrated Superphosphate ..	Sickle	..	40·00	4·00	..	44·00	12 10 0	Cuming, Smith, and Co.
" " ..	M. L.	..	40·00	4·00	..	44·00	12 10 0	Mt. Lyell M. and R. Co.
" " ..	Alberts	..	40·00	4·00	..	44·00	12 10 0	Wischer and Co.
Superphosphate	Federal Manure, O. S.	..	17·00	1·00	2·00	20·00	4 7 6	Aust. Exp. and Chemical Co.
"	J. Cockbill	..	17·00	1·00	2·00	20·00	4 10 0	J. Cockbill
"	Florida, Sickle	..	17·00	1·00	2·00	20·00	4 7 6	Cuming, Smith, and Co.
"	Hasell's	..	17·50	0·50	2·00	20·00	4 6 0	A. H. Hasell
Superphosphate No. 1	M. L.	..	17·00	*1·00*	*2·00*	*20·00*	4 7 6	*Mt. Lyell M. and R. Co.*
Superphosphate	Rohs	..	14·75	1·50	1·25	17·50	4 13 6	P. Rohs, Bendigo
Superphosphate No. 1	Wischer and Co.	..	17·00	1·00	2·00	20·00	4 7 6	Wischer and Co.
Nitro Superphosphate	Federal Manure Nitro	1·10	13·00	1·00	5·00	19·00	5 0 0	Aust. Exp. and Chemical Co.
" "	S. and F. Bugg	1·45	8·05	7·20	5·05	20·30	5 15 0	F. and S. Bugg, Kyneton
" "	Sickle	*1·39*	*14·28*	*0·84*	*2·22*	17·34	5 0 0	Cuming, Smith, and Co.
" "	M. L.	1·60	13·00	1·00	2·00	16·00	5 0 0	Mt. Lyell M. and R. Co.
" "	Wischer and Co.	1·12	11·05	0·65	7·33	19·03	5 0 0	Wischer and Co.
Bonedust and Superphosphate, 1 and 1	Federal Manure, B. S. No. 1 ..	1·50	8·50	0·50	10·00	19·00	5 7 6	Aust. Exp. and Chemical Co.
Bonedust and Superphosphate, 1 and 3	*Federal Manure Bone and Super.* ..	0·75	12·75	0·75	6·00	19·50	5 0 0	" " "
Bonedust and Superphosphate ..	J. Cockbill	1·30	12·62	2·49	4·89	20·00	5 5 0	J. Cockbill
" " ..	Hasell's	1·55	8·97	1·00	9·56	19·53	5 5 0	A. H. Hasell
Animal Fertilizer and Superphos-*phate*	A.N.A. Surprise	1·50	7·59	2·95	5·51	16·05	5 5 0	G. W. Pennell, Braybrook
Bonedust and Superphosphate ..	Rohs	1·50	8·00	4·00	5·50	17·50	5 5 0	P. Rohs, Bendigo
Thomas' Phosphate	Federal Manure, T. P.	..	..	14·00	3·00	17·00	4 5 0	Aust. Exp. and Chemical Co.
" "	Sickle	..	..	14·00	3·00	17·00	4 5 0	Cuming, Smith, and Co.
" "	M. L.	..	..	14·00	3·00	17·00	4 5 0	Mt. Lyell M. and R. Co.
" "	Wischer's	..	..	14·00	3·00	17·00	4 5 0	Wischer and Co.
Thomas' Phosphate and Superphos-phate	Federal Manure, T. S.	..	5·00	*11·00*	*1·50*	*17·50*	*4 15 0*	*Aust. Exp. and Chemical Co.*
Thomas' Phosphate and Bone Fer-tilizer	Federal Manure, B. T. 1	1·50	..	8·75	8·75	17·50	5 7 6	" " "
" " "	Federal Manure, B. T. 3	0·75	..	11·00	6·00	17·00	5 0 0	" " "
Thomas' Phosphate and Superphos-phate	Sickle	..	*5·00*	11·00	1·50	17·50	4 15 0	Cuming, Smith, and Co.
" " "	M. L.	..	5·00	11·00	1·50	17·50	4 15 0	Mt. Lyell M. and R. Co.
" " "	Wischer and Co.	..	5·00	11·00	1·50	17·50	4 15 0	Wischer and Co.
Bone Fertilizer	Federal Manure, B. F.	3·00	..	3·50	14·50	18·00	5 17 6	Aust. Exp. and Chemical Co.
" "	*Federal Manure*, B. F. Special ..	5·00	..	3·00	13·00	16·00	6 15 0	" " "
Fertilizer	Lighthouse	7·08	..	4·30	7·38	11·68	6 0 0	T. Borthwick and Sons, Portland

Bone Fertilizer ..	J. Cockbill	3·50	..	3·50	14·75	18·25	5 10 0	John Cockbill
Animal Fertilizer	Champion	6·00	..	5·40	3·90	9·30	5 5 0	John Cooke and Co.
Bone Fertilizer ..	Sickle	3·00	..	3·50	14·50	18·00	5 17 6	Cuming, Smith, and Co.
,, ,, ..	Sickle, Special	5·00	..	3·00	13·00	16·00	6 15 0	,, ,, ,,
,, ,, ..	*Horseshoe*	3·00	..	4·70	10·70	15·40	5 10 0	P. Fitzgerald, Bentleigh
,, ,, ..	Echuca	5·10	..	4·78	7·52	12·30	5 10 0	Milo Bacon Co., Echuca
Animal Fertilizer	A.N.A. Surprise..	3·00	..	6·00	9·00	15·00	5 5 0	G. W. Pennell, Braybrook
Bone Fertilizer ..	Wischer and Co.	3·00	..	3·50	14·50	18·00	5 17 6	Wischer and Co.
,, ,, ..	Wischer and Co., Special..	5·00	..	..	16·00	16·00	6 15 0	,, ,,
Blood and Bone Manure ..	*Imperial*	5·00	..	..	14·00	14·00	6 0 0	W. Angliss and Co.
.. ..	Dale's	6·00	..	..	10·00	10·00	6 0 0	N. Dale, Bentleigh

Description of Manure.	Brand.	Nitrogen.	Total Phosphoric Acid.	Potash.	Price asked for Manure per Ton.	Where obtainable.
		%	%	%	£ s. d.	
Sulphate of Ammonia	Federal Manure, A. S.	20·00	..	..	15 0 0	Aust. Exp. and Chemical Co.
,, ,,	Sickle	20·00	..	..	15 0 0	Cuming, Smith, and Co.
,, ,,	M. G. Co.	20·00	..	..	14 0 0	Metropolitan Gas Co.
,, ,,	M. L.	20·00	..	..	15 0 0	Mt. Lyell M. and R. Co.
,, ,,	Wischer and Co.	20·00	..	..	15 0 0	Wischer and Co.
Nitrate of Soda	Federal Manure, S. N	15·50	..	..	13 10 0	Aust. Exp. and Chemical Co.
,, ,,	Sickle	15·50	..	..	13 10 0	Cuming, Smith, and Co.
,, ,,	M. L.	15·50	..	..	13 10 0	Mt. Lyell M. and R. Co.
,, ,,	Wischer and Co.	15·50	..	..	13 10 0	Wischer and Co.
Blood	Imperial ..	11·17	1·45	0·08	7 10 0	W. Angliss and Co.
..	Champion	11·00	2·00	..	7 5 0	John Cooke and Co.
..	M. L.	11·00	..	..	8 16 0	Mt. Lyell M. and R. Co.
Kalnit	Sickle	..	..	12·40	4 17 6	Cuming, Smith, and Co.
,,	M. L.	..	..	12·40	4 17 6	Mt. Lyell M. and R. Co.
,,	Wischer and Co.	..	..	12·40	4 17 6	Wischer and Co.
Nitrate of Potash	M. L.	13·00	..	46·00	20 0 0	Mt. Lyell M. and R. Co.
Muriate of Potash..	Federal Manure, P. M	..	..	60·00	13 12 6	Aust. Exp. and Chemical Co.
,, ,,	Sickle	..	..	60·00	13 12 6	Cuming, Smith, and Co.
,, ,,	M. L.	..	..	60·00	13 12 6	Mt. Lyell M. and R. Co.
,, ,,	Wischer and Co.	..	..	60·00	13 12 6	Wischer and Co.
Sulphate of Potash	Federal Manure, P. S.	..	..	52·50	13 17 6	Aust. Exp. and Chemical Co.
,, ,,	Sickle	..	..	52·00	14 17 6	Cuming, Smith, and Co.
,, ,,	M. L.	..	..	52·00	14 17 6	Mt. Lyell M. and R. Co.
,, ,,	Wischer and Co.	..	..	52·00	14 17 6	Wischer and Co.

List of Fertilizers Registered at the Office of Secretary for Agriculture under the Artificial Manures Acts—*continued.*

Description of Manure.	Brand.	Nitrogen.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. In-soluble.	Phosphoric Acid. Total.	Potash.	Price asked for the Manure per Ton.	Where obtainable.
		%	%	%	%	%	%	£ s. d.	
Pacific Island Guano	A. G. C. Flag	0·50	..	3·13	11·70	14·83	..	3 7 6	H. B. Black
Dissolved Peruvian Guano	Ohlendorff's Dissolved Peruvian Guano	5·73	9·40	2·55	0·81	12·76	1·47	13 5 0	Gibbs, Bright, and Co.
Phosphatic Guano	Sinclair's Phospho Guano	0·25	..	7·23	6·01	13·34	..	2 15 0	J. Sinclair, Portarlington
Ground Rock Phosphate	*Wischer and Co., 80% Phosphate Lime*	..	..	..	36·50	36·50	..	5 0 0	Wischer and Co.
Grass, Laying-down	Federal Manure, G. L.	1·50	8·50	0·50	5·50	14·50	2·00	5 0 0	Aust. Exp. and Chemical Co.
Grass, Top-dressing	*Federal Manure, T. D.*	*1·60*	*11·00*	*0·64*	*1·30*	*12·94*	*1·50*	*5 0 0*	
" "	Sickle	0·70	16·40	0·07	1·93	19·30	..	5 0 0	Cuming, Smith, and Co.
Grass Manure	"	0·30	11·05	0·65	9·05	20·75	2·70	5 0 0	" "
Grass, Laying-down	M. L.	0·30	11·05	0·65	9·05	20·75	2·70	5 0 0	Mt. Lyell M. and R. Co.
Grass, Top-dressing	"	..	7·00	11·00	1·00	19·00	2·00	5 0 0	" "
Grass Manure	Key Fertilizer W. Co.	0·50	15·30	0·90	1·80	18·00	2·60	5 10 0	Wischer and Co.
" "	Wischer and Co.	0·75	9·80	0·75	5·95	16·50	3·00	5 0 0	" "
Potato Manure	Federal Manure Potato	1·00	14·00	0·80	1·64	16·44	6·00	6 0 0	Aust. Exp. and Chemical Co.
Potato Manure, A	Sickle	1·30	8·00	3·10	6·18	17·28	5·18	6 12 6	Cuming, Smith, and Co.
Potato Manure, B	"	1·20	14·62	0·86	1·72	17·20	4·15	6 0 0	
Potato Manure	M. L.	1·20	14·50	1·00	1·70	17·20	4·15	6 0 0	Mt. Lyell M. and R. Co.
Potato Manure, with Bone	"	1·05	8·50	0·50	7·30	16·30	8·80	6 12 6	
Potato Manure	Wischer and Co.	1·00	14·00	0·90	1·70	16·60	6·00	6 0 0	Wischer and Co.
Potato Manure, with Bone	" "	1·05	8·50	0·50	7·30	16·30	7·78	6 12 6	"
Onion Manure	Federal Manure, M. G.	2·00	11·00	0·64	1·30	12·94	5·00	6 0 0	Aust. Exp. and Chemical Co.
" "	Sickle	2·00	*13·60*	0·80	1·60	*16·00*	3·59	*6 0 0*	Cuming, Smith, and Co.
" "	M. L.	3·00	9·50	1·00	1·50	12·00	3·00	6 0 0	Mt. Lyell M. and R. Co.
" "	Wischer	2·50	9·80	1·00	1·70	12·50	4·50	6 0 0	Wischer and Co.
Pea, Bean, and Clover Manure	Federal Manure, P. B.	0·50	10·00	0·60	4·20	14·80	3·00	5 0 0	Aust. Exp. and Chemical Co.
Leguminous Manure	Sickle	..	*15·30*	*0·95*	*2·59*	*18·84*	2·99	5 0 0	*Cuming, Smith, and Co.*
" "	M. L.	..	11·50	2·00	1·50	15·00	4·75	5 0 0	Mt. Lyell M. and R. Co.
" "	Wischer and Co.	..	15·30	1·00	1·90	18·20	2·60	5 0 0	Wischer and Co.
Pea Manure	" "	..	14·45	0·85	1·70	17·00	7·78	6 2 6	
Orchard Manure	*Federal Manure, F. M.*	1·80	13·22	0·78	1·55	15·55	8·00	7 0 0	Aust. Exp. and Chemical Co.
Orchard Manure (with cover crop)	Federal Manure, N. N.	..	12·00	0·71	1·41	14·12	14·00	7 10 0	" " "
Orchard Manure	Sickle	2·40	12·92	0·76	1·52	15·20	7·18	7 0 0	Cuming, Smith, and Co.
" "	M. L.	2·35	13·00	0·75	1·50	15·25	7·20	7 0 0	Mt. Lyell M. and R. Co.
" "	Wischer and Co.	3·38	9·35	0·55	1·10	11·00	6·50	7 0 0	Wischer and Co.
Horticultural Manure	Federal Manure, H. M.	2·50	11·62	0·68	1·38	13·68	10·00	*8 0 0*	Aust. Exp. and *Chemical Co.*
" "	Sickle	4·00	11·22	0·66	1·32	13·20	8·38	8 0 0	Cuming, Smith, and Co.
" "	M. L.	4·00	11·00	0·75	1·45	13·20	8·25	8 0 0	Mt. Lyell M. and R. Co.
" "	Wischer and Co.	3·00	11·25	0·70	1·30	13·25	9·70	8 0 0	Wischer and Co.
Rose Manure	Sickle	3·94	*6·18*	*0·36*	0·72	7·28	13·94	12 0 0	Cuming, Smith, and Co.

Rose Manure	M. L.		4·00	6·50	0·50	0·50	7·50	14·00	12 0 0	Mt. Lyell M. and R. Co.
" "	Wischer and Co.		7·75	4·45	0·25	0·55	5·25	18·15	12 0 0	Wischer and Co.
Lawn Manure	M. L.		..	7·00	11·00	1·00	19·00	2·00	5 0 0	Mt. Lyell M. and R. Co.
Rape Manure	Sickle		1·39	14·28	0·84	2·22	17·34	..	5 0 0	Cuming, Smith, and Co.
Foddercrop Manure	M. L.		3·00	11·00	1·25	1·75	14·00	1·00	6 0 0	Mt. Lyell M. and R. Co.
Rape Manure	M. L.		1·20	13·00	1·00	2·00	16·00	1·00	5 0 0	" " "
" "	Wischer		1·05	8·50	0·50	7·30	16·30	7·78	6 10 0	Wischer and Co.
Vine Manure	Sickle		2·40	12·92	0·76	1·52	15·20	7·18	7 0 0	Cuming, Smith, and Co.
" "	Wischer and Co.		3·00	8·50	0·95	1·45	10·90	9·00	7 0 0	Wischer and Co.
Special Grain Manure	Federal Manure, S. G.		..	16·50	1·00	2·00	19·50	0·75	4 15 0	Aust. Exp. and Chemical Co.
Maize Manure	Federal Manure, M. Z.		2·36	10·20	0·60	6·20	17·00	2·00	6 0 0	
" "	Sickle		2·38	13·94	0·82	1·64	16·40	1·80	6 0 0	Cuming, Smith, and Co.
" "	Wischer and Co.		1·75	14·65	0·85	1·75	17·25	2·60	6 0 0	Wischer and Co.
Root Crop Manure	M. L.		3·25	7·25	1·00	2·00	10·25	4·75	6 10 0	Mt. Lyell M. and R. Co.

Description of Manure.	Brand.	Nitrogen.	Phosphoric Acid.				Mechanical Condition.		Price asked for the Manure per Ton.	Where obtainable.
			Water Soluble.	Citrate Soluble.	In-soluble.	Total.	Fine Material.	Coarse Material.		
		%	%	%	%	%	%	%	£ s. d.	
Bonemeal	Sickle	3·00	..	..	..	21·00	30·00	70·00	6 10 0	Cuming, Smith, and Co.
"	M. L.	3·00	..	..	..	21·00	30·00	70·00	6 10 0	Mt. Lyell M. and R. Co.
Bonedust	Lara	2·50	..	..	..	19·20	29·20	70·80	5 5 0	J. W. Branch, Geelong
"	Burge's	4·95	..	..	..	18·45	45·50	54·50	6 0 0	A. J. Burge, St. Arnaud
"	Dale's	3·50	..	..	..	17·00	20·00	80·00	5 10 0	N. Dale, Bentleigh
"	A. D. B.	3·60	..	..	..	19·65	24·00	76·00	5 10 0	A. Day, Bendigo
"	Eureka	3·00	..	..	..	18·00	60·00	40·00	5 15 0	J. R. Elsworth, Ballarat East
"	Braybrook	2·43	..	..	..	16·28	50·00	50·00	5 5 0	H. J. Feore and Co., Braybrook
"	Horseshoe	3·10	..	..	..	17·65	52·20	47·80	6 0 0	P. Fitzgerald, Bentleigh
"	Bullock	2·60	..	..	..	22·70	95·00	5·00	5 15 0	Heinz Bros., Ballarat
"	Jopling's	3·50	..	..	..	19·15	18·00	82·00	6 0 0	J. R. Jopling, Ballarat
"	Kleiner's	3·72	..	..	..	22·70	28·00	72·00	5 10 0	E. A. Kleiner, Wangaratta
"	Lloyd's	2·87	..	..	..	23·30	88·00	12·00	5 10 0	E. Lloyd, Box Hill
"	Vauxhall	3·86	..	..	..	23·25	33 70	66·30	6 5 0	W. Moore, Panmure
"	Rohs	4·00	..	..	..	18·00	66·00	34·00	5 15 0	P. Rohs, Bendigo

P. R. SCOTT,
Chemist for Agriculture.

Government Laboratory,
Melbourne, 13th June, 1911.

VICTORIAN EGG-LAYING COMPETITION, 1911-12,

CONDUCTED AT BURNLEY SCHOOL OF HORTICULTURE.

Progress Report for Three Months ending 30th June, 1911.

H. V. Hawkins, Poultry Expert.

No. of Pen.	Breed.	Name of Owner.	Eggs Laid during Competition.				Position in Competition.
			April.	May.	June.	Total.	
1	White Leghorn * ..	A. Brebner ..	54	55	73	182	17 (equal)
2	" ..	E. P. Nash ..	96	65	61	222	11
3	" ..	K. Gleghorn ..	21	25	95	141	28
4	Golden Wyandotte	H. Bell	0	13	95	108	37
5	White Leghorn ..	L. C. Payne ..	22	51	71	144	26 (equal)
6	Silver Wyandotte ..	Mrs. H. J. Richards	0	2	78	80	45
7	White Leghorn ..	H. Stevenson ..	16	37	22	75	47
8	" ..	T. W. Coto ..	82	73	28	183	16
9	" ..	J. O'Loughlin ..	45	73	59	177	19
10	Black Orpington ..	H. A. Langdon ..	28	37	88	153	24
11	Brown Leghorn ..	F. Soncum ..	20	22	39	81	44
12	White Leghorn ..	W. G. Swift ..	137	127	102	366	1
13	Black Orpington ..	D. Fisher	63	54	109	226	9
14	" ..	W. J. Macauley ..	0	0	32	32	50 (equal)
15	Black Minorca ..	H. R. McChesney ..	2	0	13	15	54 (equal)
16	Silver Wyandotte ..	Miss A. Cottam ..	29	38	38	105	38
17	White Leghorn ..	W. J. Eckershall ..	6	7	14	27	51
18	" ..	S. Brundrett ..	112	67	95	274	5 (equal)
19	" ..	A. Jaques ..	49	75	62	186	14 (equal)
20	" ..	H. McKenzie ..	110	75	83	268	6 (equal)
21	" ..	R. L. Appleford ..	80	125	69	274	5 (equal)
22	Black Orpington ..	P. S. Wood ..	52	25	61	138	29 (equal)
23	Golden Wyandotte	G. E. Brown ..	34	36	38	108	37 (equal)
24	White Leghorn ..	F. Hannaford ..	27	64	83	174	21 (equal)
25	" ..	B. Mitchell ..	2	81	97	180	18 (equal)
26	" ..	F. Seymour ..	4	18	60	82	43
27	" ..	Hill and Luckman ..	43	48	58	149	25
28	" ..	J. Campbell ..	58	21	32	111	35
29	Surrey	J. Anderson ..	11	37	33	81	44 (equal)
30	Black Orpington ..	Rodgers Bros. ..	53	25	60	138	29 (equal)
31	White Leghorn ..	R. W. Pope ..	123	111	103	337	3
32	Silver Wyandotte	M. A. Jones ..	30	76	98	204	13
33	White Leghorn ..	Wooldridge Bros.(Qld.)	104	114	99	317	4
34	" ..	E. Dettman ..	11	37	31	79	46
35	" ..	J. H. Brain ..	7	6	5	18	53
36	" ..	F. A. Sillitoe ..	38	128	64	230	8
37	" ..	E. Waldon ..	78	109	81	268	6 (equal)
38	" ..	Mrs. C. R. Snee ..	2	32	89	123	33
39	" ..	A. W. Hall ..	53	43	80	176	20
40	" ..	A. J. Cosh (S.A.) ..	123	107	108	338	2
41	" ..	Morgan and Watson..	18	49	43	110	36
42	White Orpington ..	P. Mitchell ..	0	4	83	87	41
43	White Leghorn ..	W. B. Crellin ..	33	35	26	94	40
44	Black Orpington ..	T. S. Goodisson ..	68	91	74	233	7
45	White Leghorn ..	T. Kempster ..	50	73	51	174	21 (equal)
46	Black Minorca ..	G. W. Chalmers ..	80	54	90	224	10
47	White Leghorn ..	C. W. Spencer (N.S.W.)	51	44	62	157	23
48	Black Minorca ..	G. James	0	0	0	0	Nil
49	White Leghorn ..	W. J. Thornton ..	55	40	40	135	30
50	" ..	C. H. Busst ..	40	48	37	125	32
51	" ..	J. W. McArthur ..	54	44	82	180	18 (equal)
52	" ..	W. J. McKeddie ..	0	1	31	32	50 (equal)
53	" ..	A. Stringer ..	4	8	31	43	48
54	" ..	F. Hodges	51	41	50	142	27
55	" ..	W. G. McLister ..	69	41	76	186	14 (equal)
56	" ..	Mrs. C. Thompson ..	7	24	8	39	49
57	" ..	G. E. Edwards ..	71	12	0	83	42
58	Faverolles ..	K. Courtney ..	50	50	44	144	26 (equal)
59	White Leghorn ..	W. H. Dunlop ..	0	45	54	99	39
60	" ..	J. J. Harrington ..	17	25	70	112	34
61	Silver Wyandotte	J. Reade	0	0	21	21	52
62	White Leghorn ..	P. Hodson	61	52	17	130	31
63	Black Orpington ..	A. J. Treacy ..	43	40	99	182	17 (equal)
64	White Leghorn ..	J. D. Read ..	14	1	0	15	54 (equal)
65	" ..	H. Hammill (N.S.W.)	70	50	45	165	22
66	White Wyandotte	J. E. Bradley ..	67	45	95	207	12
67	White Leghorn ..	C. L. Sharman ..	62	83	40	185	15
			2,860	3,139	3,873	9,872	

The weather conditions have been adverse, the rainfall greatly exceeding that of previous years. For the three months (April, May, and June) 85, 306, and 376 points respectively were recorded. On three occasions the temperature fell to 32 degrees Fah., and twice to 29 degrees, the majority of the readings being between 40 and 47 degrees. The number of eggs laid must therefore be regarded as very satisfactory.

Of the 9,872 eggs laid during the quarter, 62 were double yolk. In addition, 18 soft-shelled eggs and 8 underweight eggs (less than 1½ ozs.) were laid, but are not included in the total. Two pens only (Faverolles and Leghorns) were responsible for the soft-shelled eggs.

A mild outbreak of chicken pox occurred; no deaths resulted, but two birds were removed and replaced. Owing to prolapse of the oviduct, two Leghorns were destroyed. Prolapsis is not uncommon with non-sitting breeds.

The Leghorns, Orpingtons, and Wyandottes have responded well to the attention given them. One pen of Minorcas has not yet laid an egg, whilst only 18 eggs have been returned from another pen of the same breed. These pens have seriously affected the average, but render the competition all the more educational. The varying results have aroused considerable interest.

During the period under review there have been upwards of 1,000 visitors, including numerous residents of other States and many oversea arrivals. Some of the latter, who have settled in the irrigation districts, have since erected poultry pens, similar to those at Burnley, on their holdings. The competition has thus been of practical value to these new settlers. In addition the University students, in agriculture and veterinary science, and also the students at the Burnley School of Horticulture, have had instruction in scientific poultry farming.

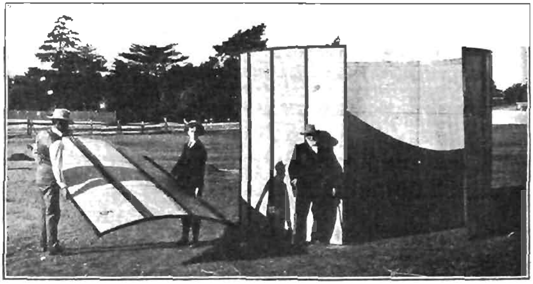
SILO CONSTRUCTION.

(Continued from page 503.)

I. S. Kenyon, C.E., Engineer for Agriculture.

ALL STEEL SILOS.

The patent all-steel silo is manufactured by Mr. A. H. Russell, Essendon. The Department has made a special arrangement with Mr. Russell, whereby, as all selling charges, &c., are saved, a considerable reduction in the cost is possible. In addition to the steel sections supplied by the patentee, the Department sends out the roof and elevator material and gear. These silos have the advantage of being white-ant proof, and are



ALL-STEEL SILO.

not affected by climatic influences. They are also of much less weight than the other types.

Directions for Building an All-steel Silo.

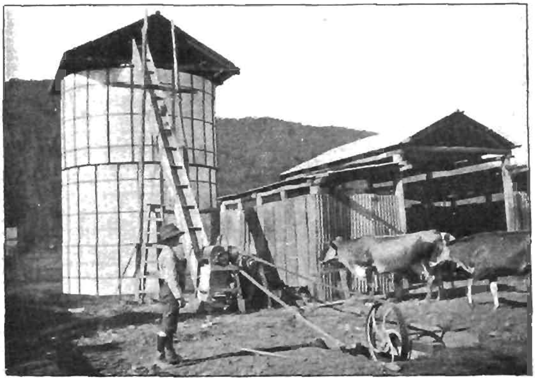
Foundation.—Drive a peg in the centre of the site. Fix a trammel to suit the diameter of silo and mark a circle on the ground for stump-holes. Sink holes for stumps 2 ft. deep on this circle, spaced, centre to centre, 5 ft. 8½ in. (measured in a straight line from inside face of stumps). Sink stumps in the centre of each space on the same circle, keeping the face of all stumps true to the trammel. The faces of stumps will then be 2 ft. 11½ in. centre to centre. The tops of all stumps are to be quite level.

Walls.—First set up the section with the port holes, which should be so located as to make the transport of silage to the feeding place as easy as possible. This should be fixed only temporarily. Put the top sections inside the circle of stumps; then erect the bottom sections, putting in a few bolts in each joint. Do not yet tighten these bolts. Pack the

vertical joints with spun-yarn; put in all the bolts and tighten up. Securely fix the sections to stumps with dog spikes.

Now take one of the long lengths of roof timber, attach block and tackle to end, set up against a vertical joint and fasten. This is to be used for hoisting the top sections into position. Bolt horizontal joints loosely, breaking the vertical joint. It will be necessary to shift the upright timber as each section is placed in position. Do not tighten any of the joints till spun yarn has been packed in. After packing all joints screw up all bolts tightly; then put the stiffening plates on top of silo.

ROOF.—The ridge of the roof should run in a line with the elevator, which is fixed under the gable. The ridge and intermediate purlins are supported on six stanchions bolted to the top of the silo. Each stanchion



ALL-STEEL SILO—SECTIONS.

is made of two angle irons riveted together and spread out at foot 13 in. The flanges are cut away for 4 in. down from top and holed for ⅝ in. bolts. The foot is drilled for two ⅝ in. bolts to correspond with holes in angle iron at top of silo. The two stanchions for ridge purlins are 3 ft. high, the other stanchions 2 ft. high. Bolt on the two longest stanchions opposite one another to carry the ridge purlins, to which they are bolted. Allow the ends to project 2 ft. over each side of silo. This is to permit the use of block and tackle for hoisting. Bolt the outside purlins to top of silo, keeping them parallel with the ridge and 6 in. from inner face of wall. With the aid of a straight-edge and square set off so that the ends of these purlins are on a line with a mark made 9 in. in from end of ridge purlins. With the straight-edge, get pitch of roof and bolt on the remaining stanchions to take the intermediate purlins. Cover the purlins with 9-ft. sheets of corrugated iron, allowing a lap of one and a half corrugations. Secure with 2½-in. spring-head nails at every third corrugation. Fix three lengths of 16-in ridging with 2½-in. spring-head nails every 2 ft.

Material for an All-Steel Silo.

The material required, in addition to the wall sections supplied by the patentee, and stumps, which can be provided by farmer, is as follows:—

Hardwood, 4-in. x 2-in.: 2 20-ft., 4 10-ft., purlins.
Hardwood, 3-in. x 1½-in.: 2 12-ft., 2 20-ft., uprights for ladders.
Hardwood, 3-in. x 1-in.: 2 20-ft., treads for ladders.
Oregon, 9-in. x 2-in.: 1 16-ft., scaffold.
Stanchions, 2 3-ft., 4 2-ft.
Galvanized iron corrugated sheets, 26 gauge: 16 6-ft., roof.
Galvanized iron ridging, 26 gauge: 3 lengths 18-in.
Galvanized iron spring-head nails, 3 lbs. 2½-in.
Bolts, nuts, and washers, 2 5-in. x ⅜-in.
Bolts, nuts, and washers, 4 4½-in. x ⅜-in.
Bolts, nuts, and washers, 4 3-in. x ⅜-in.
Wire nails, 5 lbs. 2-in.

CONCRETE SILO.

The popularity of concrete is steadily increasing for the construction of all classes of buildings. When one considers that it is fire, white ant, and vermin proof, and added to that the virtue of being cheaper than any other material, and more durable, its use should be fully justified. There is very little difficulty in making good concrete if care be taken in the following advice here given.

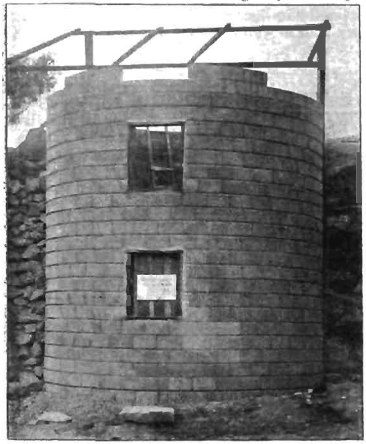
Concrete is composed of metal (broken stone) or gravel mixed with sand and Portland cement in certain proportions and wetted. In "fine" concrete, no metal is used, small gravel taking its place. Cement and sand alone form a mortar or "compo." The proportions of the various materials depend upon the air voids or spaces in the metal or gravel, and upon the strength of concrete required, varying with the uses to which it is to be put, engine foundations and hollow blocks representing the strong side, and building foundations and solid walls the weaker class. The mortar or compo of sand and cement should be sufficient in bulk to fill all the voids in the metal, preferably somewhat in excess, say about 10 per cent.

The voids can be found by filling a kerosene tin with the metal or gravel, making a bulk of 4 gallons; the whole is then weighed, allowance being made for weight of tin. Water is poured in until flush with the surface and the tin with its contents is again weighed. Thus, as water weighs 10 lbs. to the gallon, the percentage is arrived at. For instance, a kerosene tin of metal weighed 60 lbs. deducting the weight of the tin. When filled with water, it weighed 78 lbs. Consequently, the void space was represented by 18 lbs. of water, while the whole volume, 4 gallons, weighed 40 lbs. Thus, the percentage of void was found to be 45. A good mixture in this instance would be 6 parts of metal, 2 parts of sand, and 1 part of cement.

In the example given, the metal was fairly large—about 2½ in. The percentage of void space increases as the size of metal or gravel diminishes, running from 35 to 45 in ordinary cases. For fine work, such as hollow blocks, fine gravel, if not greater than ½-in. diameter, is used. If it is mixed with sand, so much the better. In such a case, cement should be added in a proportion ascertained in a similar way to that already described, and should be not less than one-sixth of the bulk, and about one-half of the sand contents.

Before, however, working out the proportions, the material should be selected, care being taken that the metal or gravel is of fairly strong and clean stone; soft sandstones or limestones are to be avoided. The sand, in particular, should be sharp and washed clean—it should lose but little

in bulk by being washed. Both clay and loam are drawbacks, particularly the former. Attention should next be paid to the cement. Tests of cement are rather too delicate and complicated for the ordinary man, so that reliance must be placed on the brand. On the whole, the locally-made cements are to be preferred to the imported makes, as they are all reliable and slow setting, a desirable feature for the amateur builder, while the imported brands, though very good in some cases, are not so in all. A cask or barrel of cement weighs about 375 lbs.; a cubic foot packed weighs 120 lbs. In colonial makes, it is generally supplied in bags, two of which go to the barrel. As a rough-and-ready rule, one barrel of cement goes to the cubic yard of concrete. It must be borne in mind that one cubic yard of gravel or metal is required for one cubic yard of concrete, the cement and sand serving only to fill up the voids.



CONCRETE SILO.

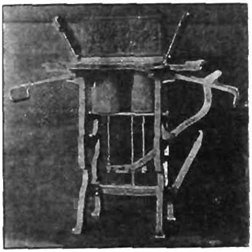
For mixing, a platform or smooth space is required. A mixing board can readily be knocked up out of ordinary boards. Frames also are made out of boards to hold, say, half a cubic yard of metal, one-sixth of a cubic yard of sand, and one-twelfth of a cubic yard of cement, or in any desired proportions. The sand, which should be dry, is first put in its frame on the mixing board, and then the cement is added. The two are thoroughly mixed by being turned over with shovels, and the mixture is spread as thinly as possible in one layer over the board. The gravel or metal is then measured, and spread on top of the cement and sand. Mixing by shovelling is thoroughly done, after which water is added; a watering can with a rose is the best for the latter purpose. Shovelling is continued until the whole mass is sufficiently wetted, that is, when in a semi-dry condition, but not enough so as to run or be sloppy.

A batch may be, as mentioned above, half a cubic yard, or, for bigger work, one cubic yard. Shelter from the wind is advisable, otherwise there will be loss of cement. The concrete should be mixed as near its final position as possible; it must be used at once, and not allowed to stand over the dinner hour, and, under no circumstances, until the next day. If it is used in bulk, it may be lightly rammed into position with a small-headed rammer. Care should be taken in ramming not to keep it up longer than the commencement of setting, a matter of a few minutes only; nor should

ramming be continued after the compo has been worked to the surface and free moisture is showing on the top. Any old work, including that finished off the previous day, should be well wetted and picked over to form a bond. In dry weather, or at any time except in moist weather, the concrete, whether in bulk or in blocks, should be kept damp by wetted bags or other means for a few days to allow the setting action to proceed properly.

The Midget Giant Concrete Block-making Machine Company Proprietary Limited, of Central Railway Building, Flinders-street, Melbourne, has contracted with the Department to erect silos of the types listed. A machine as illustrated, however, can be purchased outright for £11, with a complete outfit of plates for making bricks of various shapes and sizes, for building purposes, including silo bricks. The dimensions of the bricks are 12 in. x 6½ in. x 6 in., the latter dimension being the thickness of the wall. These bricks, in order to fit in with the circular plan of the accepted form of silo, are circular in section.

Concrete is mixed as described above, a sufficient quantity put into the machine, and the brick moulded; it is then lifted out on a "bearing off" board; these are ordinary lengths of 6-in. x 1-in. flooring boards about 13½ in. long, and put aside until set. After 24 hours they can be gently removed from the boards and laid out in rows and well watered with an ordinary watering-can, or a hose spray. They should not be allowed to become at all dry for at least two weeks, but should be watered night and morning; the more water they have applied, the harder the bricks will become. If the bricks are exposed to the wind, or in an unprotected place, they should be stacked not more than five high, with a small space between each stack; this prevents the wind drying the whole surface of the brick too quickly. The bricks should not be used for construction of walls for at least three weeks. Care should be taken to lay "bearing off" boards on one another when not in use to prevent twisting, sufficient boards for the first day's work only are necessary.



MIDGET GIANT MOULDING MACHINE.

One man with the assistance of a lad can make up to 300 of these bricks per day—sufficient to build a wall 10 ft. by 10 ft. One cask of cement and 1 cubic yard of gravel and sand, in the proportions of 5, 3, and 1, will make about 200 of these bricks; or sand only (6 to 1), 160 bricks. A man with the same assistance, after a little practice, will lay 200 bricks per day. The bricks are set in cement mortar of suitable strength, say 4 to 1, in the same manner as ordinary bricks; a double wall is made for the first course, and then a single wall is proceeded with. The bricks break joint at 6 in. in succeeding courses, which allows the hollows in bricks to come over each other, and makes a complete wall, allowing the free circulation of air throughout the interior. Where sand and gravel, or rough and fine material are not both obtainable, excellent bricks can be made from sand only and cement in the proportions of 6 to 1.

RE-INFORCING.—While in the course of construction, the walls must be re-inforced by laying on the top of every ring ordinary fencing wire clipped together at the joint and built in with the bricks; for the first 4 ft., three wires to every course, and for the remainder, two wires—one wire only may be used if thought worth while for the top 6 ft.

The following are the quantities and directions for building a 69-ton silo:—

WALLS.—In constructing a silo with cement or concrete bricks, the first operation is to make the bricks after the following manner. Good clean sharp drift sand having been procured, and a good brand of cement, clean up a site on the ground and measure out according to previous instructions. The whole should then be passed through a ¼-in. mesh sieve, and watered until sufficiently damp. This can be tested by taking up a handful of the material and giving it a squeeze; if it holds firmly together, it is ready to be shovelled into the mould of the machine.

The height of a 70-ton silo is 21 ft., and requires 1,710 bricks, 90 of which form the footing course; the 100-ton silo requires 720 more bricks.

FOUNDATION.—Roughly level site for a diameter of 16 ft., making provision if on sloping land for drains to carry off any flow of water. Fix a centre point by placing a 2-in. pipe firmly in the ground, so as to receive a 2-in. pole; from this centre attach a piece of quartering 7 ft. 3 in. long to act as a trammel, which will describe a circle having a diameter of *14 ft. 8 in. This will be the inside diameter of the silo when built.* Care should be taken to fix the pole plumb, so as to obtain the accurate circle.

Cut out a trench 6 in. deep and 12 in. wide, the bottom to be level. The inside line of trench will be 7 ft. from centre pole. Then lay therein two rows of cement bricks side by side with cement mortar, gauged 4 parts sand and 1 part cement, and grout in solidly. The next course should be laid lengthwise, using the 7 ft. 3 in. trammel to keep the same true to centre. Each course of bricks must be well bedded and jointed in cement mortar as above; and, in every course, lay along the centre of bricks lengths of galvanized fencing wire as specified above, clipped together at joint, first gouging out the brick to bed the wire in (this may be done when making the brick by just running the finger over it).

Form port holes as shown, two bricks wide by four courses high, the inside face of brickwork to be bagged over smoothly so as to be free of *mortar projection, and the V-joint of outside face struck smoothly with* point of trowel. Build in four 7-in. x ½-in. bolts in top of silo wall to bolt down roof wall-plates. When walls are completed, the earth floor of silo is to be levelled off about 3 in. above outside ground with earth filling rammed to an even surface.

If the silo should be erected on a very exposed situation and it is found that heavy rain penetrates the wall, a weatherproof coating made as follows may be used:—2 lbs. soft soap, 12 lbs. alum, and 30 gall. water, applied evenly to the outside of the silo bricks with a white-wash brush.

ROOF.—The roof to have 4½-in. x 3-in. oregon wall plates bolted down to brickwork, the ridge plate 9 in. x 1½ in. propped up off wall plate with 4-in. x 2-in. stud halved on to same, and stayed with 3-in. x 1½-in. strut.

RAFTERS.—The rafters to be 4-in. x 2-in. hardwood spaced 3 ft. centres notched on to wall plates and well spiked to same and ridge. Fix six 3-in. x 1½-in. collar ties to each pair of rafters to batten rafters with

3-in. x 1½-in. hardwood, and cover with 9-ft. sheets of 26-gauge corrugated galvanized iron, lapped one and a half corrugations and secured with 2½-in. spring-head nails at every third corrugation. Fix three lengths of 16-in. galvanized ridging with spring-head nails every 2 ft. Fix four 5-in. x 2-in. oregon struts from wall to corner of wall plates.

Port Holes.—Provide port holes with doors, formed with sheet iron cut 3 ft. x 2 ft. 6 in., and nail on same three strips of 3-in. x 1½-in. hardwood, each 24 in. long. The inside wall to be lime-washed.

Material for Cement Silo.

The following is a list of the material required for the erection of a 70-ton concrete silo:—

Hardwood, 3-in. x 1½-in.; 2 12-ft., 6 10-ft., 6 16-ft., door ledges, collar ties, and purlins.
Hardwood, 4-in. x 2-in.; 12 10-ft., rafters.
Oregon, 9-in. x 1½-in.; 1 20-ft., ridge.
Oregon, 5-in. x 2-in.; 4 8-ft., struts.
Oregon, 4½-in. x 3-in.; 2 16-ft., wall plates.
Galvanized iron corrugated sheets, 26 gauge; 16 9-ft., roof.
Galvanized iron plain sheets, 24 gauge; 2 72-in. x 36-in., doors.
Galvanized iron ridging, 26 gauge; 3 lengths 16-in., roof.
Galvanized iron spring-head nails, 2½-in.; 3 lbs., roof.
Bolts, nuts, and washers, 4 17-in. x ½-in.
Wire nails, 5 lbs. 3-in.
Cement, 16 casks.
Sand, 16 cubic yards.
Elevator material is the same as for 70-ton wood and iron silo.

Department of Agriculture, Victoria.

APPLICATION FOR THE CONSTRUCTION OF A SILO.

....19......

The Director of Agriculture, Melbourne.

I hereby apply for the construction of a silo and of an elevator to fill same, and I hereby agree to comply with the conditions set forth on back hereof.

....Signature.

Witness to signature..

Particulars to be Furnished as far as Possible.

Name of applicant in full..
Name of parish and No. of allotment..
Postal address..
Nearest or most convenient railway station..
Distance from station..
Capacity of silo required..
No. of stock to which silage is to be fed. Cows..................Sheep..................
Crops proposed to be grown for silage..................No. of acres..................
Make and No. of chaffcutter..................Diameter of cutter spindle..................
Size of horse-works..
Steam or oil engine..................Make and horse-power..................
Proposed filling arrangements..
Proposed method of payment—In full or on terms as set forth in conditions.......
....

General Conditions.

Before the erection of a silo is commenced, the applicant must either pay in full the amount claimed by the Department of Agriculture as the cost of supplying and erecting the silo, or he must pay one-third of such amount in cash, and lodge two promissory notes each for one-half of the balance, payable at 12 and 24 months respectively. Should the property on which the silo is erected be sold at any time, the balance of cost unpaid shall become payable forthwith.

The applicant must cart the silo material from the nearest railway station to the site; must meet the builder when advised, convey him to the work, board and lodge him and provide him with the necessary assistance while building.

The green fodder must be chaffed and the silo filled and weighted under the supervision of an officer of the Department, or in accordance with instructions issued by the Department. Full records must be kept of the results obtained from feeding the silage and a report made to the Department.

Special arrangements may be made for the erection of silos of a class approved by the Department other than those listed below, but if the cost is greater than for the same tonnage, the cash payment must be increased accordingly.

Details of Capacity, Measurements, and Cost.

	Capacity. Tons (Approx.)	MEASUREMENTS— Inside *Diameter*	Height.	Foundat'n Posts.	Approx. Weight of Materials	*COST, INCLUDING ELEVATOR— Not exceeding 100 miles from *Melbourne.*	Over 100 miles but not exceeding 200 miles *from* Melbourne.	Over 200 miles from *Melbourne.*
	tons.	feet	feet		tons	£	£	£
Wood and Iron	50	12½	21	7	3¾	38	40	42
	70	14¾	21	8	4	40	42	44
	100	14¾	30	8	5	50	52	54
‡All Wood	70	15	20	8	7	36 (19)	39 (20)	42 (21)
	105	15	30	8	10	44 (21)	49 (23)	54 (25)
All Steel	50	13¼	20¼	14	1½	50	51	53†
	70	15	20¼	16	1¾	54	55	57†
	90	16⅔	20¼	18	1¾	59	60	62†
	110	18¾	20¼	20	2	64	65	67
Midget Concrete Block	70	15	21	.	2½	65	66	67
	100	15	30		3½	90	91	92

* If elevator not required, cost of silo as shown above will be reduced £8 for a 21-ft. silo and £9 10s. for a 30-ft. silo.

† These prices are only possible owing to patentee having made a special arrangement with the Department whereby all selling charge , &c., have been saved him.

‡ If the applicant provides the necessary hardwood, the cost of the material supplied by the Department will be reduced to the amount shown in brackets.

For the wood and iron and all wood silo, 3 men for 4 to 6 days; for the all steel silo, 3 men for 3 to 5 days; and for the concrete block silo, 1 youth for 20 days, are required to assist the builder. If the full complement of men stipulated is not provided, the farmer will be charged 9s. for each man short, whether for a whole or part of a day.

For the concrete block silo, the farmer must supply, on the ground, water, 13 cubic yards of sand, or 12 cubic yards of gravel and 7 of sand, and 2 cwt. of No. 10 fencing wire. The block-maker will take about 10 days, and the builder a similar period. The blocks must stand at least 2 weeks before being used.

Foundation posts to be supplied by the farmer. For the wood and iron and all wood silo, they are to be 6 ft. x 6 in. x 4 in. sawn, split, or round, with one truly square face. For the all steel, they are to be 2 ft. x 5 in. x 5 in sawn, split or round.

Quotations will be given, if desired, for silos without erection or freight.

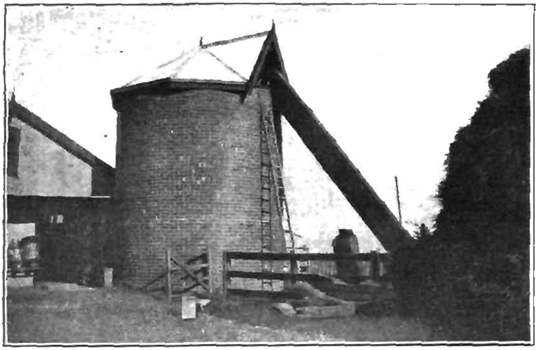
It is impossible for me to conclude this article, the last while officially connected with the Department, without reference to the valuable assistance rendered in connexion with silo work by the Foreman Builder, Mr. J. Wilson, the Architect, Mr. C. M. Neild, and the supervisor, Mr. G. H. Baker. To Mr. Wilson, special notice is due, as during his four years with the Department, he has continually suggested improvements in the construction both of the silo and the elevator.

REINFORCED BRICK SILOS.

R. T. Archer, Senior Dairy Inspector.

For durability, silos constructed of concrete or brick will, no doubt, be the most satisfactory. The former type, which is described elsewhere in this issue, may be relied on to give good results wherever suitable gravel is obtainable. In some districts, however, where clay is available and good bricks may be burnt on the ground, it will be more economical to build a brick silo. In others, too, where the roads are in a satisfactory condition and the farm is not too far from a railway station, the necessary bricks may be delivered cheaply.

The most economical type of brick silo is that of 4½ in. work reinforced with galvanized wire. One has been built by Mr. W. C. Greaves,



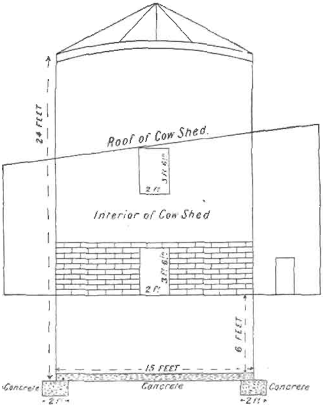
REINFORCED BRICK SILO AT MR. W. C. GREAVES' FARM, MONOMEITH.

of Monomeith, who is highly pleased with the results obtained. The principle has also been adopted in the construction of overground water tanks on a large scale in the Ballarat district for some years past.

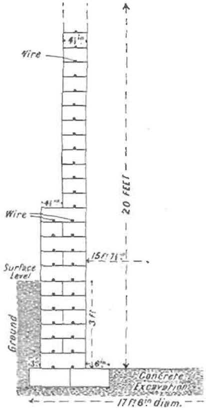
In constructing the silo at Monomeith, an excavation 6 ft. deep was made; and round the outside of it, was a trench 7 ft. deep and 2 ft. wide, to receive a good well-rammed concrete foundation. The floor of the silo was also covered with concrete to the depth of about 6 in. The brickwork was then started, with the bricks (hollow upwards) laid in cement; 4½ in. work. When the surface of the ground was reached, No. 8 galvanized wire was placed between every second layer of bricks, to reinforce. It would not cost much more to run the wire in right from the start, and thereby considerably add to the strength of the structure The wire was run half way round the silo and then raised to the next tier, taken round the other half and then to the next tier, and so on. It would be preferable to run the wire round every tier.

The port holes, 3 ft. 6 in. high x 2 ft. wide, open into the shed. One is immediately above the ground level (floor of the shed). The

second is as high as the roof of the feeding shed will allow. The jambs, which are of red gum with a bevel out all round, are kept in position by strong hoop iron worked into the brickwork and spiked on to the jambs. When building, the wires were run across these openings and cut off afterwards. The doors are made of double $\frac{7}{8}$ in. flooring, T. & G. red deal. They are placed in position from outside, before filling is commenced, and kept there by two $\frac{3}{4}$ in. iron plugs placed in holes bored in the bottom jambs. These plugs can be removed when the door is to be taken out to get at the silage. The top door is removed in the shed and the silage burrowed out upwards till the surface is reached. Care is taken to remove a little from the exposed surface each day, and so none is wasted.



PLAN OF SILO AT MONOMEITH.



SECTION OF REINFORCED BRICK SILO DESIGNED BY MR. BRAZENOR.

The wall plate, which was cut at Messrs. James Moore and Sons, South Melbourne, is of circular shape, so as to fit the wall of the silo. It cost £2. The roof is octagonal, and is made of galvanized iron, but is unnecessarily expensive; simpler and yet effective types are given in the article by Mr. Kenyon. The silo is 18 ft. 6 in. above, and 6 ft. below ground, which gives a depth of 24 ft. clear, whilst the diameter (inside) is 15 ft. It is lined with about half an inch of good cement and is limewashed each time before filling. It took 5,000 bricks and 13 casks of the best cement. The cost works out as follows :—

	£	s.	d.
Excavation and concrete	8	10	0
Material and labour	37	14	6
Wallplate, roof, and doors	18	0	0
	£64	4	6

This does not include cartage from the station—about a mile. Since it was erected, there has been an increase in cost of both material and labour.

The silo is now being filled the fifth time, three times with maize and twice with oats. In filling, care was taken to trample well round the outsides, not much in the middle. There has been no drawing away from the walls, which is a frequent cause of waste. Mr. Greaves says:—

> The silo and its advantages have given great satisfaction. Practically no waste, if some weight is used on top. There is no sign of weakness in any part of the structure.

By mathematical calculation this structure does not show sufficient margin of safety, though the experience of Mr. Greaves points to it being safe in practice.

Mr. J. A. S. Brazenor, architect, Ballarat, who constructed the reinforced brick water tanks referred to, has furnished the following description of a silo 20 ft. high x 16 ft. diameter:—

Excavate to a sound foundation with a fall to the centre. A footing of bricks on edge bedded level on concrete with 6 in. of cement concrete to form the bottom of the silo.

Build the base of two rings of 4½ in. bricks on edge; and on this, 3 in. in from the edge, build 9 in. work on the flat, 3 ft. high. Then single brick (4½ in. work) 17 feet or higher. No. 8 galvanized fencing wire is run in the centre of each tier, in the mortar. Do not break the wire, but bend it up between the bricks and continue on the next course. All joints of the brickwork to be flushed up and neatly jointed.

Provide openings, say 2 ft. 6 in. wide x 2 ft. 3 in. deep, 3 ft. x 2 in. x ⅜ in. iron lintel; also, to each opening, an iron shutter 3 ft. wide x 2 ft. 6 in. deep, 22 gauge flat galvanized iron. When the cement is set, cut the wire bonds where showing across the openings. The openings may be 5 ft. from the ground, then 10 ft. and 15 ft.

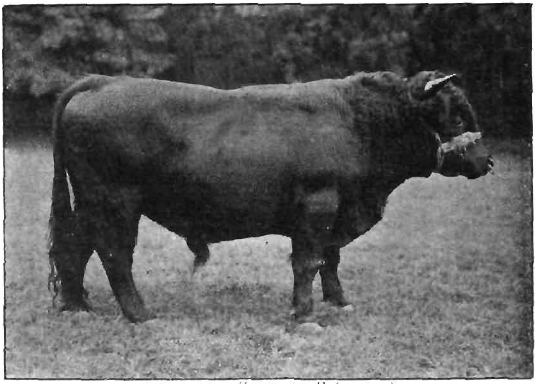
This silo would take 6,500 bricks to build it. The total cost, at Ballarat prices, would be £43 18s., allowing 50s. per 1,000 for bricks; cement, 16s. per cask; excavating, 1s. 6d. per yard; sand, 3s. per yard; wire, 11s. per cwt.; bricklayers, 12s. 6d. per day; labourer, 8s. per day. If a dry sound foundation were available about £5 5s. might be saved on the concrete bottom.

DEXTER KERRY DAIRY CATTLE.

J. S. McFadzean, Senior Dairy Supervisor.

A few photographs of Dexter Kerry cattle are reproduced herewith. At the Melbourne Royal Agricultural Show last year the exhibits of this class of dairy stock attracted much attention. Though this State was the first of the Commonwealth to import these cattle, they have not made the headway here that their good qualities would warrant; and consequently many people have not even seen them.

In 1892, the late Mr. David Syme brought out from England a Dexter Kerry bull and three females, but the stock from these were mostly purchased by breeders in the other States. The New South Wales Government stud of this breed originated from Mr. Syme's importation.



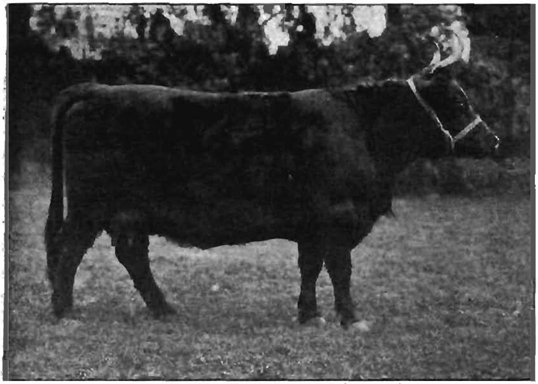
DEXTER BULL "TOM TIT" (2 years).
By "Marston Tom Thumb" (imp.) ex. "No. 12" by "Denham Melbourne" (imp.)

At first glance, they appear small in comparison with other dairy cattle, and the farmer who likes a big cow is apt to look on the Dexter Kerry as somewhat of a toy animal. Their appearance is, however, most deceptive. They are certainly a very low-set breed, being particularly short in the lower leg, but they are very weighty; and the cows are heavier than many that would pass as average-sized animals in some dairy herds.

In conformation, they set at defiance the generally accepted rule that a dairy cow should be somewhat lean in appearance, for they have nicely rounded, well-shaped and well-fleshed bodies. Their shortness of limb, and exceptional rib and chest development, preclude their having anything like the fine-topped shoulder that is so much fancied in the taller milking breeds; but even the admirer of the more spare-framed type of dairy cow cannot say that the typical Dexter is a coarse cow in any respect.

One of their distinctive characteristics is the nicely shaped udder, with well-placed teats of good size and colour; and they are generally found to carry the broad, well-defined escutcheon that is indicative of heavy and continuous milking qualities. Many instances are recorded of cows of this breed giving up to 20 quarts of milk daily, and making up to 400 lbs. of butter yearly. In England, in 1896, one cow was credited with giving over her own live weight in milk in 17 days.

Within the past year several cows of this breed in Victoria have had their milk yields recorded; and they have shown that the Dexter Kerry must prove a valuable addition to the dairy stock of this State. The cow "Waterlily," whose picture is reproduced on this page, has given 714 gallons of milk of 4.2 test in 9 months, and is still yielding 7 quarts per day. A heifer ("Shiela"), now only 30 months old, has yielded 458 gallons of 5.1 test milk in 9 months, and a 5-year-old cow, "*Killow*,"



DEXTER COW "WATERLILY" (7 years).
By "Waterville Punch" (imp.) ex. "Miss Ham" by "Ham" (imp.)

has reached 410 gallons in six months. Such records would be very creditable indeed in a high class herd of any milking breed, and, coupled with their low cost to keep, demonstrate the claim of the Dexters to the soubriquet of the "*Closer Settlement cow.*"

The executors of the late D. Syme still have some very good Dexter Kerry stock at Mordialloc. Also, during the past year, two other studs of this breed have been established in Victoria, viz., those of Mr. J. Weldon Power, at Horsham, and Dr. S. S. Cameron, at Hawthorn. These have lately been added to by further importations from New South Wales, and Mr. C. K. Harrison, of Sale, has also introduced the nucleus of a herd from the same State.

It is only their being practically an unknown breed here that has kept the sterling qualities of the Dexter Kerry cattle from becoming more widely recognised in Victoria; but now that a forward move has been made to spread the breed, and competition at shows among the several breeders may be anticipated, these useful stock should soon become popular.

Their docility and handy size will no doubt at once attract the attention of the suburban householder, and they make an ideal family cow; but, being bred originally from hardy mountain cattle, they are also very good foragers, keeping up condition and milking well under most strenuous conditions. On this account, residents of hilly country who require cows that can make a good showing with little care should give this sturdy milking breed a trial.

ANSWERS TO CORRESPONDENTS.

The Staff of the Department has been organized to a large extent for the purpose of giving information to farmers. Questions in every branch of agriculture are gladly answered. Write a short letter, giving as full particulars as possible, of your local conditions, and state precisely what it is that you want to know. *All inquiries forwarded to the Editor must be accompanied by the name and address of the writer.* This is very necessary, as sometimes insufficient information is furnished by the inquirer.

SORE TEATS.—F.B.L., who states that he is "New Chum" milker, inquires whether washing the teats prior to milking would cause them to become sore, or would it be the fault of the milker. He is following instructions given by a practical milker, *viz.*, grip the teats in hollow at base of thumbs and squeeze same with points of fingers, care being taken to have nails cut short.

Answer.—Washing the teats with a clean rag before milking will not make them sore, provided you milk in the proper manner. The advice given you is right. While the teats are sore, wash before milking with warm solution of Condy's Fluid; and, after milking, dry and smear with carbolized vaseline.

FEEDING MILLET TO STOCK.—E.T.P. asks whether millet is injurious to stock.

Answer.—There is no danger in feeding millet to stock, unless the growth has been checked during the growing period, and this may be overcome by "wilting." Excessive amount of almost any green feed will induce tympanitis in horses, which should be watched for until the animals are accustomed to the fodder.

WORMS.—W.H.W. writes:—"I have a mare that does not seem to be doing quite as well as I think she should. (The foal has been weaned about six weeks.) She has passed several worms about 6 or 7 inches long. Would the worms be the cause of the trouble? If so, what treatment do you recommend?"

Answer.—(1) If in large numbers, the worms would be responsible. (2) Take of Sulphate of Iron 1 oz., Powdered Gentian 2 ozs., mix, and divide into four powders; give one every morning in damp feed. After the last has been given put on bran mashes or green grass for one day. Then give a 6-drachm Aloes ball. You should also have the teeth attended to.

NON-PREGNANCY OF SOWS.—H.B. states that two of his sows, served by a 14-months-old boar, are still not in young, although another sow served a fortnight earlier is due to farrow.

Answer.—Perhaps your sows are in too good condition; if so, reduce them, and, a few days before next "season" appears, syringe out the vagina with water in which a little baking soda is dissolved. You should also keep the boar well forward with a good grain ration. If much further difficulty is experienced, the sows should be fattened.

SWOLLEN TENDONS.—E.W.C. writes regarding his mare, and states that, after a little exercise, the back tendons swell, and cause the animal to walk on her toes and become very lame. Stevens' ointment and a three-months' spell have been tried, but the swelling has re-appeared. The mare has always got a cough.

Answer.—The mare is suffering from chronically sprained tendons, and may only be fit for slow work. The only treatment advisable now is firing, blistering, and rest for three months. The cough referred to is also probably chronic, and should not cause any great anxiety.

CASTRATING AGED RAMS.—P.F. inquires as to the best method of castrating aged rams.

Answer.—If the rams are in any condition at all, it would be advisable to sell them as they are. There is nothing to be gained from castration at their age. If, for other reasons, castration must be done, slit the purse, tie the artery and spermatic cord firmly, cut off the testicle, use an antiseptic (Lysol for preference), and freely apply Stockholm tar all over the opening made. The latter precaution is very important.

SKIN DISEASE.—W.J.E. inquires as to treatment of calf suffering from skin disease. About half the skin is affected. It is in blotches, the hair looks rough at first, and gradually comes off in masses that stick together at the roots—one piece off the back was about 2 feet long and 4 inches wide, leaving the hide bare, except for patches of white scurfy kind of scab.

Answer.—It may be a form of mange or ringworm. The affected parts should be well smeared with soft soap, leaving the soap on for three or four days. Subsequently wash off with warm water, and mop the skin with a clean soft cloth. When dry, rub well into the skin once daily a little of the following mixture :—Oil of Tar 1 part, Raw Linseed Oil 10 parts. Wash the skin thoroughly once a week, and begin again with the tar dressing.

BALANCED RATION.—S.S.F. states that he is desirous of making up a well balanced grain ration, say oats, peas, barley, and linseed, for horse and cow feed. He also asks what would be a good condiment to mix with it as an appetiser.

Answer.—5 lbs. oats, 2 lbs. peas, 1 lb. barley, and ½ lb. linseed, given with 3 lbs. bran and 16 lbs. chaff, would give a well balanced ration (having a nutritive ratio 1 :7.1) for the horse. For the cow, more bran and linseed should be allowed, as well as a larger amount of chaff. If an animal is in health, a condiment such as suggested is unnecessary.

RATION OF OATS FOR DRAUGHT HORSES.—J.W. asks what is a fair ration of oats for a working draught horse doing ploughing or equally hard work. He has been giving 15 lbs. per day, but finds it too expensive.

Answer.—12 lbs. to 14 lbs. of oats is a fair daily ration for draught horses in hard work, and little other fodder such as hay or chaff is required in addition. For your purpose, however, it may be more economical, as well as efficacious, to feed about 8 to 10 lbs. of oats with 14 or 15 lbs. of best quality chaff or oaten hay. In this ration, allowance is made for a fair proportion of grain already in the chaff or hay.

COW PEAS.—J.W. asks whether cow peas are suitable for milking cows; also, whether they taint the milk.

Answer.—Cow peas constitute an excellent fodder for milking cows. The milk is not tainted.

APPLE DRYING.—M.McD. asks how to dry apples.

Answer.—Apples, either green or ripe, of any kind may be utilized for this purpose, but if made from cooking varieties the product will be better. They are prepared by being pared, cored, and sliced, either by hand or machinery; then steeped in a solution of ½ lb. of salt to a gallon of water and allowed to remain there for two or three minutes, spread on wooden trays of a convenient size—usually 24 x 36 inches—after which they are subjected to the fumes of sulphur for a few minutes, and placed in the sun or kiln to dry. Paring, coring, and slicing machines may be obtained from the leading ironmongers at prices varying from 5s. to £3 or £4, the higher priced ones being suitable for factory purposes. Sulphuring is accomplished by obtaining a box, the inside measurements of which are the same length and breadth as the tray, making one side of it a door and nailing cleats a few inches apart on the inside of each end, on which the trays of fruit are placed, the lower tray being a foot or so from the bottom. A little flower of sulphur is then put in a vessel to which a lighted coal is applied and then placed on the bottom of the box; the door is closed, and the fruit allowed to remain in the fumes for five to eight minutes. The object of this is to keep the fruit from darkening while drying, and to give it a presentable appearance. The fruit should not be allowed to remain in the fumes longer than is sufficient to attain that end, as over-sulphuring is objectionable. If only a small quantity of apples is being treated, it may be sulphured by placing the trays one on top of another with the ends of the lower one resting on two supports a foot or so from the ground. The burning sulphur should be placed underneath, and a sheet or tarpaulin thrown over the whole so as to retain the fumes, and allowed to remain as prevously stated. When so treated, the fruit is placed in the sun or kiln and allowed to remain there till the bulk is sufficiently dried, when it is removed, thrown into a bin, and allowed to remain there, turning it over occasionally in the meantime, till the moisture is equalized between the fruit which may be over-dried, and that which is still on the moist side. When this is accomplished, the product is ready for casing; and, if for sale, is usually put up in 56-lb. boxes. The sulphuring process is only to keep the apples a good colour. If not so treated, they become dark, and do not command a ready sale; but, if for home use, would be just as palatable, if not more so, than the sulphured article.

WHITE ANTS.—H.G.H. is anxious to know of an effective method of keeping white ants out of buildings.

Answer.—Use ant stops made of tin dishes inverted on top of stumps; all nails driven through them must fit tightly. Steps leading up to verandahs or doors must not quite touch. White ants will not thrive without an earth connexion.

BINDING SAND.—H.G.H. asks for instructions for binding sand about his premises. Gravel and tar are available.

Answer.—Boil tar until a portion allowed to cool is of the consistency of pitch. A little oil may be added. Care must be taken in boiling. The sand should be swept clean and the hot tar sprinkled on through perforated tins or sprinklers and then covered with dry sand. Do the work in warm dry weather.

IDENTIFICATION OF PLANTS.—P.C., W.M., W.J.P., J.P., W.R.R., M.S., S.W., C.E.B., J.I., and G.H.W. forward specimens of plants for identification. W.M. states that, when the weed forwarded is in full flower, sheep can scarcely be moved without several being lost. The lambs, particularly, are liable to die. C.E.B. mentions that many sheep have died from eating the plant of which he submits a specimen. In some cases immediate bleeding under the eye restored the affected animals.

Answer.—1. (P.C.).—*Panicum Crus Galli*, L. Barnyard or Cockshin Grass. A cosmopolitan native grass. It is a fairly useful fodder grass, especially in moist situations along sandy river banks, or around stagnant water, and will also grow on somewhat saline soil, particularly on brackish water-courses and on moorland. The grass seeds freely and germinates readily, and birds are fond of the grain. The seed does not appear to be stocked by any Melbourne seedsmen, but allied plants are the Japanese and Pearl Millets, which are stocked, and could be recommended in preference to the above.

2. (W.M.).—*Isotoma fluviatilis*, F.V.M. A native plant belonging to the *Lobeliaceæ*. All species of this order contain a sharp burning, or even narcotic milky, sap, which taken internally in excess causes inflammation of the alimentary canal and even death. An allied species, *I. longiflora*, is deadly to horses in South America, large doses producing death, small ones violent purging, very small doses merely acting as a tonic stimulant. *I. fluviatilis* is less poisonous, but is not a plant to encourage on pasture land. The plant should be hoed up or pulled up after rain, before seeding, and the stock should be kept from the land where it is abundant, especially if other feed is scarce. If the ground is properly cultivated and drained or limed if necessary, it tends to disappear. The plant prefers moist badly drained soil, deficient in lime. The first consideration should be the eradication of the plant. For those lambs that should obtain a poisonous quantity of the weed, the best course to pursue would be the administration of castor oil as a purgative, followed by Blaud fluids as gruel or linseed tea or lime water.

3. (W.J.P.).—*Heliotropium europæum*, L. Common Heliotrope. The plant is a cosmopolitan weed, obnoxious on account of its unpleasant odour. It is useless for fodder but not poisonous, and is best kept down by cultivation, fallowing, and root crops. A drilled and well cleaned crop of maize is also good to clean the ground.

4. (J.P.).—*Panicum miliaceum*, L. The True Millet. It is very eligible for green fodder. Several varieties occur, one with black grains. They all need a rich and friable soil, also humidity. It is one of the best grains for poultry, but also furnishes a palatable and nutritious article of diet in many parts of the tropics.

5. (W.R.R.).—*Medicago lupulina*, L. Black Medick. An introduced annual or biennial leguminous plant, which seeds freely, and so maintains itself. It is a useful pasture plant, especially on clay soils unsuitable for lucerne. On dry soils it is somewhat stunted, but steadily improves and enriches them with nitrogenous humus, if not too closely cropped. It is more luxuriant on richer soils, and then may become almost perennial when continually cropped. It will also grow on somewhat swampy, boggy or moory ground if this is limed, and is a common impurity in lucerne seed.

6. (M.S.).—*Cenchrus tribuloides*, Hedgehog or Burr Grass. A native of North America, but now naturalized and widely spread in Victoria. The plant is useless for fodder, and obnoxious on account of its burred fruits, which are unusual among true grasses. It can be kept down by cultivation, or cutting before seeding, or burning off patches where it is thick.

7. (S.W.).—*Hypericum perforatum*, L. St. John's Wort. A native of Europe now naturalized in this State. Being a perennial rooting deeply, it is difficult to eradicate. On cultivated ground it can be suppressed by deep ploughing, summer fallowing and root crops. Badly infested pasture land can only be cleared by being brought under cultivation for a time. Conifers will soon suppress St. John's Wort, but it will grow under trees casting only partial shade, or trees planted too far apart. Poisons are too costly and, if effective, render the ground useless for other vegetation for a long time. Land laid down in pasture after cultivation has destroyed the adult plants, and can be sprayed with a mixture of 1 part of Phenyl to 20 or 40 parts of water if seedlings of St. John's Wort reappear. This will keep them down until the pasture is re-established, but it will not destroy old rooted plants. Further information regarding this plant is given on page 17 of *Weeds, Poison Plants, and Naturalized Aliens of Victoria.*

8. (C.E.B.) *Lobelia pratioides.* A native plant belonging to the Lobeliaceæ. All species of this order contain a sharp burning or even narcotic milky sap, which, taken internally in excess causes inflammation of the alimentary canal, and even death. An allied plant, *Isotoma longiflora*, is deadly to horses in South America, large doses producing death, small ones violent purging, and very small doses merely acting as a tonic stimulant. *Lobelia pratioides* is less poisonous, but is not a plant to encourage on pasture land. The plant should be hoed up or pulled up after rain before seeding, and stock kept from land where it is abundant, especially if other food is scarce.

The best treatment for affected animals is as follows :—

Horses—(1) Bleed at jugular vein, taking out half a gallon of blood, combined with (2) hypodermic injection of Sulphuric Ether, 2 drachms. (3) If the horse is capable of swallowing, give 1 bottle of raw linseed oil followed by drench of warm milk and treacle.

Bullocks.—Same as in horses, but increase hypodermic injection to 3 drachms. The next best treatment to the injection of Sulphuric Ether, in the horse or bullock, is—3 wineglassfuls of whisky in a pint of milk, or aromatic Spirits of Ammonia, Spirits of Nitrous Ether, each 2 ozs.; water added, 20 ozs.

Sheep.—(1) Bleed. (2) Inject 40 drops of Sulphuric Ether. In poisoning by this plant, which is a narcotic poison, a considerable quantity of toxic material is absorbed into the blood stream, which material affects the nerve centres. By bleeding a considerable amount of the toxic substance is removed.

9. (J.I.) *Cynara cardunculus*, L. The true garden Artichoke. It was originally a garden escape, and has now become naturalized as a weed in several parts of Victoria. It is not generally considered a serious weed, and appears to be easily kept under by cutting on pasture land or by cultivation on arable land. Since the plant has a well-defined and well-recognised economic value, its proclamation would not be advisable, since the Thistle Act demands the complete eradication of any proclaimed plant wherever, or for what purpose, it may be grown.

10. (G.H.W.) *Linaria elatine*, L. Hairy Toad-flax. One of the Fox-glove family, several of which are poisonous or injurious to stock. The plant in question is an introduced weed, and has no poisonous properties, and we have no record of it as a plant injurious to stock. It has a strong bitter taste, and was formerly employed in medicine internally as a remedy for anæmia, externally for application to scratches. It has recently been shown that the closely allied *Linaria striata* contains a glucoside which yields prussic acid when acted on by the ferment emulsion, so that this poison might be developed in the stomach of an animal eating this plant and another containing emulsion. The plant is a cyclic weed, *i.e.*, more abundant in one year than in another. In cultivated ground, clean cultivation and the prevention of seeding by hoeing, &c., will keep it down. On pasture land, cutting before seeding, scarifying and manuring will help to suppress it.

STATISTICS.

Rainfall in Victoria.—Second Quarter, 1911.

TABLE showing average amount of rainfall in each of the 26 Basins or Regions constituting the State of Victoria for each month and the quarter, with the corresponding monthly and quarterly averages for each Basin, deduced from all available records to date.

Basin or District.	April.		May.		June.		Quarter.	
	Amount.	Average.	Amount.	Average.	Amount.	Average.	Amount.	Average.
	points.	points.	points.	points.	points.	points.	points.	points.
Glenelg and Wannon Rivers	154	226	290	285	384	363	828	874
Fitzroy, Eumerella, and Merri Rivers	181	258	359	318	378	381	918	957
Hopkins River and Mount Emu Creek	122	215	289	256	346	309	757	780
Mount Elephant and Lake Corangamite	115	211	227	245	305	277	647	733
Cape Otway Forest ...	226	332	417	401	556	464	1,199	1,197
Moorabool and Barwon Rivers	104	223	300	236	291	266	695	725
Werribee and Saltwater Rivers	70	210	318	210	363	243	1,381	663
Yarra River and Dandenong Creek	126	330	484	306	732	372	1,342	1,008
Koo-wee-rup Swamp ...	164	327	450	308	619	379	1,233	1,014
South Gippsland	194	414	394	312	542	431	1,130	1,157
Latrobe and Thomson Rivers	182	313	491	278	687	378	1,360	969
Macallister and Avon Rivers	43	182	372	145	433	255	848	582
Mitchell River	34	234	408	226	420	286	862	746
Tambo and Nicholson Rivers	31	182	413	177	423	253	867	612
Snowy River	66	245	351	275	576	397	993	917
Murray River	8	159	297	180	243	272	548	611
Mitta Mitta and Kiewa Rivers	32	232	417	305	431	527	880	1,064
Ovens River	52	253	513	340	455	540	1,020	1,133
Goulburn River	44	202	389	254	468	350	899	806
Campaspe River	47	180	367	252	370	310	784	742
Loddon River	36	155	278	193	284	248	598	596
Avon and Richardson Rivers	24	134	217	180	224	223	465	537
Avoca River	31	145	205	184	227	221	463	550
Eastern Wimmera	58	158	238	237	250	309	546	704
Western Wimmera	81	180	175	217	238	268	494	665
Mallee District	22	119	185	156	346	181	553	456
The whole State	71	201	290	212	394	306	755	719

100 points = 1 inch.

H. A. HUNT, *Commonwealth Meteorologist.*

Perishable and Frozen Produce.

Description of Produce.		Exports from State (Oversea). Quarter ended 30.6.1911.	Exports from State (Oversea). Quarter ended 30.6.1910.	Deliveries from Government Cool Stores. Quarter ended 30.6.1911.	Deliveries from Government Cool Stores. Quarter ended 30.6.1910.
Butter	lbs.	7,507,892	1,373,408	7,780,584	89,944
Milk and Cream ...	cases	2,056	226	30	...
Cheese	lbs.	196,560	13,080	219,730	24,280
Ham and Bacon ...	"	98,040	..	...	...
Poultry	head	2,910	390	1,896	1,015
Eggs...	dozen	...	.	24,574	27,898
Mutton and Lamb	*carcases*	*35,155*	*209,637*	1,328	37,279
Beef	quarters	1,427	6,519	...	1,007
Veal	carcases	772	916	163	75
Pork...	"	1,530	103	648	267
Rabbits and Hares ...	pairs	70,272	168,930	14,044	44,637
Sundries ...	lbs.	...	...	78,014	14,560

R. CROWE, *Superintendent of Exports.*

Fruit, Plants, Bulbs, Grain, &c.

IMPORTS AND EXPORTS INSPECTED FOR QUARTER ENDING 30TH JUNE, 1911.

Description of Produce.	Imports. Inter-State.	Imports. Oversea.	Exports. Inter-State.	Exports. Oversea.
Apples ...	732	1	62,200	107,419
Apples, Custard	61	—	—	—
Apricots ...	28	—	838	—
Bananas, bs.	77,883	62,417	—	—
Bananas, cs.	6,016	8,736	3,455	—
Barley ...	39,200	60	—	—
Beans ...	185	260	—	—
Black berries	198	—	63	—
Bulbs ...	1	325	72	17
Cherries ...	350	—	910	—
Chillies ...	1	117	—	—
Cocoa beans	—	1,543	—	—
Cocoanuts ..	—	204	49	—
Coffee beans	—	2,353	—	—
Copra ..	—	132	—	—
Cucumbers	827	—	44	—
Dates ...	—	2,244	1	—
Figs ..	42	382	5	—
Fruit—				
Canned ...	—	—	—	1,766
Dried ...	—	16	—	956
Mixed ...	142	25	2,281	—
Grapes ...	64	—	879	65
Gooseberries	215	—	70	—
Green ginger	45	394	—	—
Hops ..	—	98	—	—
Jams, Sauces	—	—	—	1,287
Lemons ...	7,731	76	220	1,360
Linseed ...	8	299	—	—
Totals ...	133,729	79,682	71,177	112,875

Description of Produce.	Imports. Inter-State.	Imports. Oversea.	Exports. Inter-State.	Exports. Oversea.
Loquats ..	211		4	—
Logs .	1,734	5,831	—	—
Mace ..	—	66	—	—
Maize ..	—	36	—	—
Nutmegs .	10	99	—	—
Nuts ...	464	1,695	47	—
Oats ...	6,780	4	—	—
Olives ...	39	—	—	—
Onions ..	4	21	7,542	—
Oranges ...	83,610	490	850	6
Passion ...	864	—	625	9
Peaches ...	38	—	4,247	—
Pears ...	144	1	101,888	8,4
Pepper ...	—	420	—	—
Peas, Dried	12,595	166	—	—
Pineapples	8,870	—	625	17
Plants ..	461	269	2,176	64
Plums ...	71	—	2,031	—
Potatoes ..	1,013	—	59,460	—
Quinces ...	341	—	505	—
Raspberries	9	—	—	—
Rice ...	6,167	80,794	—	—
Seeds ...	1,253	8,680	—	—
Spice ...	—	136	—	—
Strawberries	11	—	—	—
Tomatoes ...	10,698	—	197	—
Turnips ...	1,837	28	—	—
Vegetables	4,148	197	2,955	—
Wheat ...	44	5	—	—
Yams ...	179	54	—	—
Grand Totals	275,324	187,677	254,327	122,29

Total number of packages inspected for quarter ending 30th June, 1911 = 839,624.

J. G. TURNER, *Chief Horticultural Officer.*

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THE "ESCUTCHEON": A GUIDE TO MILKING MERIT.

J. S. McFadzean, Senior Dairy Supervisor.

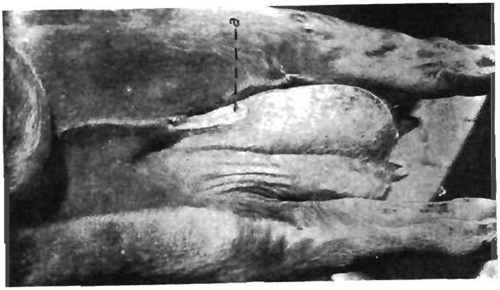
In purchasing dairy stock the value of each animal must, under present conditions, be based largely on its appearance. Without the characteristic that is known as dairy type, a well-bred bull or cow will not attract much attention from buyers; and, even if certified to have a good milking pedigree, this must be supported by a somewhat typical dairy appearance, or the animal will not find ready sale.

Almost every dairy farmer has some knowledge of what constitutes dairy type; and he will discern milking quality in stock with more or less certainty, according to his experience and natural aptitude. A preference may be shown for one breed or colour more than another; but certain lines of conformation are accepted by all as indicative of dairy quality. This has resulted from the experience of generations of stockmen; and, in the main, these dairy points are so well defined that a good judge of a dairy cow in one breed will make a very close estimate of the value of those of other breeds merely by comparison, and without any actual experience of them.

Where dairy farmers vary is in their estimates of the several points of excellence that go to make up the perfect type of cow; each being accorded a value varying with individual fancy, or by reason of experience with animals weak or strong in certain features. Few cows are found to closely approximate to perfection in dairy type; but those of that quality possess a certain symmetry of form which at once distinguishes them from the average animal, and appeals to the eye of almost any one interested in cattle. Cows such as these will seldom prove indifferent milkers; and, as they are but infrequently met with, and less often change hands, they call for very little study by the dairy farmer. But it is with medium and inferior milking stock that difficulty is found in arriving at the value from appearance; and, as it is with such that most people have to deal, any point that has special bearing on milking quality must be of more than ordinary interest to buyers.

1. FLANDERS, CLASS B.
Yield, 14 qts. (8 mos.).

2. FLANDERS, CLASS B.
(e) Vulvan tuft.
Yield, 11 qts. (7½ mos.).



3. FLANDERS, CLASS C.
(a) Right cuissard tuft.
Yield, 16 qts. (6½ mos.).

There are three lines of variation in milk production, viz., the quantity of the daily yield; its quality; and the length of time the flow is sustained. When a cow is in full milk, her daily yield, and also its quality, may be ascertained with fair accuracy by a few days' trial; but how long she will continue in milk is a matter of no little uncertainty to many. If she is on sale as a stripper or a springer, the buyer has only her appearance to guide him as to what sort of a milker she is; and, to most people, a cow at this stage is more or less a risky purchase.

In arriving at an estimate of the value of any dairy stock one feature that is of particular significance in regard to milk production is frequently overlooked, viz., the "escutcheon." Not many people are acquainted with the intricacies of this feature as indicating excellence in dairy cattle; and there is no doubt that, if it were better understood by dairymen, the knowledge would be of much service. To this end, several photographs of escutcheons are reproduced here; and the description that accompanies them will help to illustrate how the future milk production of a cow may be approximately estimated, even while she is yet a heifer.

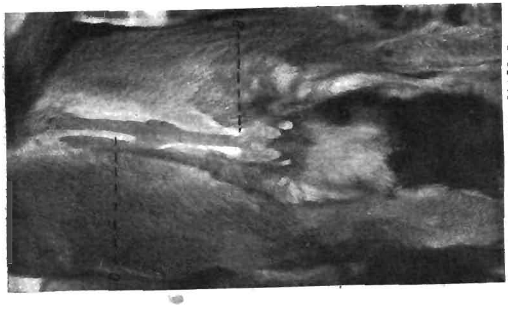
These photographs are from stock on dairy farms in different parts of the State. In several instances, the actual yields have been furnished by the owners, and they are given here. Some interesting comparisons are thus shown between the actual and the estimated yields; and, while there are some discrepancies between these, none are of such a nature as to raise any question against the value of the system which they are intended to illustrate, more especially when the conditions under which the cows are working are considered.

Where cows are dependent on pasture they will only milk up to their full capacity if they are in the flush when the grass is at its best. In this way, cows that are grazed are not always seen to best advantage, unless on sown pasture. Very few of those under notice get any feed other than the natural grass; some get a little; none are fed so as to bring them up to their full capacity. Those of one herd were at a big disadvantage this past year through being trucked some distance to another farm, the change necessarily interfering with their yield.

The term "escutcheon" is applied to that surface over which the hair on the posterior surface of the udder and haunches grows upwards, and in a contrary direction to the down-growing hair on the rest of the animal's body. The extent of this surface varies greatly. In some cows, it covers the whole of the inner haunch up close to the rump bones below the base of the tail; in others, it takes in only a portion of the udder; while there are innumerable variations between these extremes. More than eighty years ago the theory was put forward that the possible quantity, as well as the term of continuity of each cow's milk yield, could be predicted from the appearance of her escutcheon; and, wherever this theory has been thoroughly tested, it has proved to be approximately correct.

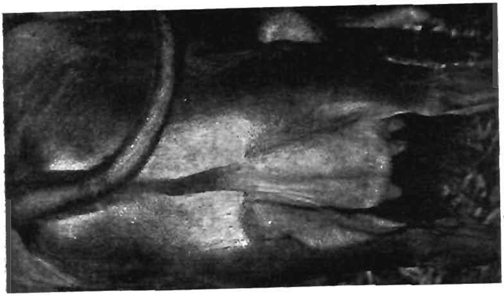
Escutcheons have been classed into ten main varieties, but some of these are only rarely met with. Each variety is possible of being divided into several sub-varieties or classes, which is done on ratio of size, as subsequently described. Only four of these subdivisions are used here, as these reach far enough for all practical purposes. The main varieties, as named, will be best understood by reference to the several photographs.

Flanders, Figs. 1, 2, 3.	Curveline, Figs. 10, 11, 12.	Bicorn, Fig. 20.
Left Flanders, Fig. 4.	Demijohn, Figs. 13, 14, 15	Horizontal, Figs. 21, 22.
Selvage, Figs. 5, 6, 7.	Square, Figs. 16, 17.	
Double Selvage, Figs. 8, 9.	Limousin, Figs. 18, 19.	

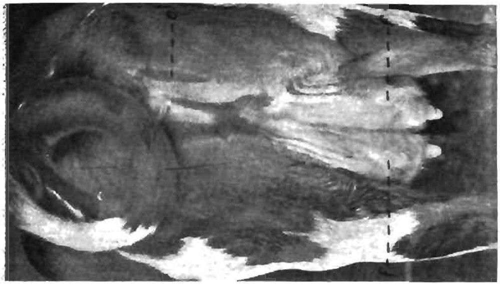


4. LEFT FLANDERS, CLASS C.
(*a*) Thigh tufts. (*c*) Long buttock tuft.
Heifer calf.

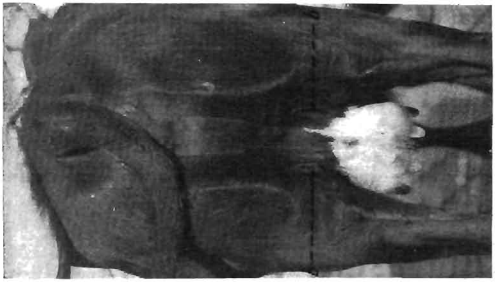
5. SELVAGE, CLASS C.
(*a*) Left babian tuft. (*b*) Perineal tuft.
Yield, 12 qts (5 mos.).



6. SELVAGE, CLASS B.
No tufts or ovals.
Yield, 13 qts. (8 mos.).



9. DOUBLE SELVAGE, CLASS C.
(*c*) Right buttock tuft. (*f*) Udder ovals.
Yield, 12 qts. (New cow).



8. DOUBLE SELVAGE, CLASS B.
(*b*) Perineal tufts (2).
Yield, 10 qts. (New cow).

7. SELVAGE, CLASS C.
Heifer calf.

In each variety, when of its full possible size, the lower portion of the escutcheon is somewhat shield-shaped, with the corners reaching to the twist of the thigh; and the sides sloping down from that point to inside the thigh below the udder. The upper portion in the four first-named, and also in the Square, curves from the corners of the shield, inwards and upwards towards the base of the tail. With the exception of the Horizontal, in all others it runs up and across the perineum in varying shapes. Briefly described:—

The *Flanders* extends up to about the base of the tail covering all the surface between the thighs from the udder to the genital opening (vulva).

The *Left Flanders* runs up on the left side only. The photograph of this in No. 4 does not show this left side as it should be, on account of the tufts of down-growing hair running through it, which show in light markings.

The *Selvage* runs up through the middle of the perineum, as is plainly shown in Figs. 5 and 6.

The *Double Selvage* is very clearly shown in 8. It runs up both sides, leaving a strip of descending hair down the centre, which may extend all, or only part of the way, to the udder.

The *Curveline* extends in an arched line across, which is also clearly shown.

The *Demijohn* has the upper portion short, and more or less straight across the top, this upper portion being something of a short selvage; and the whole escutcheon of this variety when full has the formation of the "ace of spades."

The *Square* may be described as a Flanders with a right angle section cut out of the upper right side. Fig. 16 shows this variety almost perfectly.

The *Limousin* has the arched line of the Curveline replaced by an angle in the centre line. Fig. 18 is very exact in upper outline, but is rather narrow in the shield.

The *Bicorn* may be described as a diminutive Double Selvage, extending up only a short distance, and ending sharp. That shown in Fig. 20 is very small, even of its class.

The horizontal has only the lower or shield formation; the top line crossing from corner to corner more or less straight across. The "leather" or wrinkling at the top of the udder often prevents these markings from being plainly shown in photographs; but in handling the cow they will be easily distinguished.

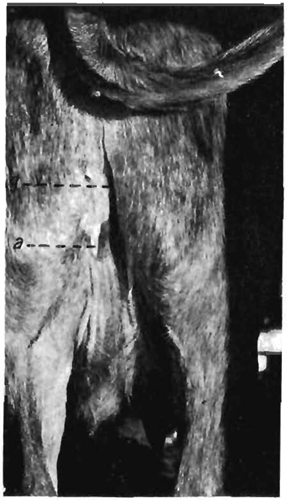
The four sub-varieties or classes in each main variety, which are referred to later on as A, B, C, and D respectively, range by comparative reduction from what should be the full extent of each in A class, down to what might be the smallest, in D class. The decrease from class to class may be roughly estimated at about 25 per cent. Both upper and lower portions of the escutcheon, as well as the number and extent of adverse tufts—which are described later—are to be considered in making this estimate.

Besides the ten main varieties, with their thirty sub-varieties, crossed forms of the main varieties are frequently met with, such as that shown in Fig. 23. These must be valued by comparison with those varieties from which they are derived, or which at least they resemble.

At various points on the surface of the escutcheon, there will frequently be found down-growing tufts of hair. These indicate a shortening of the milking term. Such markings are of a more or less elongated oval shape.

10. CURVELINE, CLASS C.
(*a*) Right thigh tuft. (*c*) Left buttock tuft.
Yield, 13 qts. (6 mos.).

11. CURVELINE, CLASS B.
(*g*) High mesian tuft.
Yield, 10 qts (7½ mos.).



12. CURVELINE, CLASS B.
(*a*) Left cuissard tuft. (*g*) Mesian tuft.
Yield, 14 qts. (18 mos.).

and are referred to hereafter as "tufts"; and the position of each is indicated in the several photographs as follows:—

(*a*) Cuissard, or thigh tufts (encroaching on udder), Figs. 3 and 4.
(*b*) Perineal tufts (on perineum), Figs. 5 and 8.
(*c*) Ischiatic or buttock tufts (near buttock), Nos. 4, 9, and 10.
(*d*) Babian tufts (at side of vulva), Figs. 5 and 20.
(*e*) Vulvan tuft (descending from vulva), Fig. 2.

These five tufts are all faulty markings, to be considered of significance according to their size and number, and point always to some diminution of the milking term; and more especially is this reduction marked if the hair of the tufts is coarse and bright.

There are two other markings which must not be confounded with those five just mentioned, for they are favourable indications. They are:—

(*f*) Udder ovals (on back quarters of udder), Fig. 9.
(*g*) Mesian tuft (dart-shaped, on perineum), Figs. 11 and 12.

If the udder ovals are of coarse hair their value is reduced; whereas those of fine soft hair are only found on heavy milking cows.

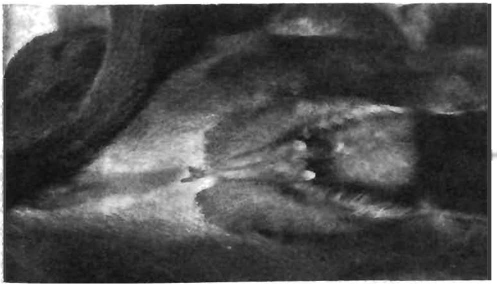
The mesian "tuft" is really an extension of the up-growing hair in the form of a dart, occurring in those varieties that otherwise do not run up the perineum. It points to an extended milking term.

As the milk flow is somewhat reduced naturally, shortly after the cow is again in calf, that period is taken as the failing point when estimating the continuity. Thus, reference to a cow as giving fifteen quarts for eight months will mean that her maximum daily yield in the flush will be fifteen quarts, and she will hold to about one month from her next calving. Twelve quarts for six months would mean a twelve-quart maximum from a cow that would dry off about three months before freshening again. If a cow does not get in calf she may milk on for a year or longer without going dry; though her milk will vary in quantity according to the food available.

The following table may be taken as approximate of the milk production possible from cows of medium size in the several varieties and classes as indicated by their escutcheons. It should be explained that, inasmuch as cows usually calve once a year, they may be taken to be in milk three months on the average before falling in calf. This period (three months) has therefore been added in all cases (see last column), so that the full lactation period may be estimated.

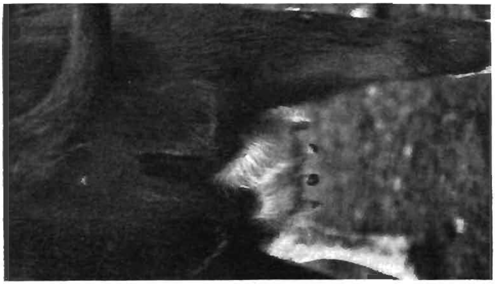
Class.	Variety.	Maximum Yield.	Holding Period.	Full Lactation Period.*
A.	Flanders	20 quarts	8 to 9 months	11 to 12 months
,,	Curveline and Selvage	19 ,,	,,	,,
,,	Left Flanders and Double Selvage ..	18 ,,	,,	,,
,,	Bicorn, Demijohn, and Square ..	17 ,,	,,	,,
,,	Limousin and Horizontal	15 ,,	,,	,,
B.	Flanders	18 ,,	7 to 8 months	10 to 11 months
,,	Selvage, Curveline, and Demijohn ..	17 ,,	,,	,,
,,	Left Flanders and Double Selvage ..	16 ,,	,,	,,
,,	Bicorn and Square	15 ,,	,,	,,
,,	Limousin and Horizontal	13 ,,	,,	,,
C.	Flanders	16 ,,	6 to 7 months	9 to 10 months
,,	Selvage and Curveline	15 ,,	,,	,,
,,	Left Flanders and Double Selvage ..	14 ,,	,,	,,
,,	Bicorn, Demijohn, and Square ..	13 ,,	,,	,,
,,	Limousin and Horizontal	10 ,,	,,	,,
D.	Flanders, Selvage, and Curveline ..	12 ,,	5 to 6 months	8 to 9 months
,,	Left Flanders, Bicorn .. .. / Double Selvage, Demijohn, and Square	10		,,
,,	Limousin and Horizontal	8 ,,	,,	,,

* Under proper conditions of feeding and management.



13. DEMIJOHN, CLASS B.
Heifer calf.

14. DEMIJOHN, CLASS D.
Yield, 8½ qts. (Heifer)



15. DEMIJOHN, CLASS C.
Yield, 12 qts. (5 mos.).

In estimating the value of the various forms of the escutcheon, the principal point for consideration is the width and evenness of contour in the lower or shield-shaped portion. As previously mentioned, this should extend well out on the thigh—see Figs. 2, 5, 8, and 22—and, without inclining in towards the udder, it should run in unbroken line up or across the perineum, according to the manner of that variety. Development of this extent, free from adverse tufts, and accompanied by udder ovals of soft texture, marks such an escutcheon as belonging to the A class; and indicates that the cow is a heavy and continuous milker. Each noticeable diminution in the size of this lower escutcheon may be taken as indicating

16. SQUARE, CLASS B.
Yield, 14 qts. (7½ mos.).

17. SQUARE, CLASS B.
(*a*) Right cuissard tuft.
Yield, 12 qts. (Heifer).

a reduction in the milk flow as per above table. The upper portion usually reduces in size correspondingly with that of the lower. In the D class, the feathering, or curl of hair that marks the corners of the shield, will be found close in towards the udder. It is in these smaller escutcheons of the C and D classes that the thigh or cuissard tufts (*a*) run in to the udder; coming down from about where the upper and lower portions of the escutcheon meet, and extending at times low down on the sides of the back quarters of the udder in long markings enlarged at the lower end. These are sometimes oval in shape, and should not be mistaken by the learner for udder ovals (*f*).

The deteriorating significance of the various adverse tufts must be determined from the extent of escutcheon they misplace. A full Flanders with two good ovals would be in the top class of its variety at twenty-two quarts or over for a big cow, down to sixteen quarts—or even less—for a small cow; and the milk flow would be sustained close up to each calving. On a medium cow, an escutcheon slightly narrower, and showing but one, or no oval, would mark an eighteen-quart maximum; and, if a babian or ischiatic tuft of any considerable size were showing, it would point to the cow drying off some six weeks before calving. The smaller the escutcheon is, and the more tufts there are present, the greater will be the reduction in both the yield and the milking term.

In Fig. 4 we have a marked example of the encroachment on a Left Flanders of the buttock and thigh tufts. This is a heifer calf about eight months old; and, judging from the width of the escutcheon on both thighs, if it were not for the tufts she would be in the B class, and make into a sixteen-quart cow. The right cuissard (*a*), however, runs in to the udder from the thigh, reducing the breadth there. The left buttock—or ischiatic tuft (*c*)—is also unusually long; and another long tuft is shown below it on the left, running in to the udder in the position of the left cuissard, which is an unusual formation. The effect of these tufts is the placing of this heifer at least not higher than the minimum in the C class; for it is more than probable that she will not hold to more than six months, and her maximum will be fourteen quarts. This happened to be the only photograph of a Left Flanders available for illustration; so, in order to understand the shape of this variety, it is necessary to consider it as if both tufts on the left were absent.

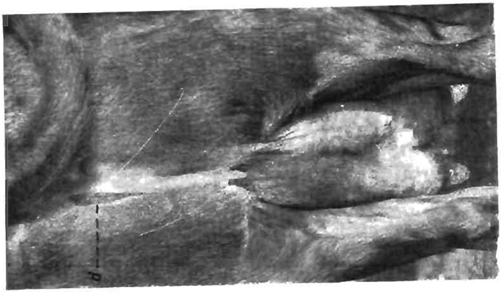
In the three escutcheons shown of the Selvage variety, Fig. 5 has good breadth and shape, but both babian and perineal tufts are present; Fig. 7—a heifer—fails in breadth, and is also somewhat short; while Fig. 6 has even shape, fair breadth, and is free from adverse tufts. With udder ovals, and a little more width at thigh, this would make a Selvage of the A class.

Turning to those of the Curveline as shown in Figs. 10, 11, and 12, the first is very narrow, hardly reaching the thigh; the next is very fair in width, but is slightly reduced by the right cuissard; while the last, though slightly uneven in the upper outline and showing a small left cuissard, has good width. This, supported by a full mesian, makes this escutcheon the best of the three.

If the several forms of escutcheons were of regular shape, and the tufts occurred in any definite order, the placing of the respective values would be a much easier matter; but the variation in both is remarkable—in fact, it is a rare thing to find two that are closely identical.

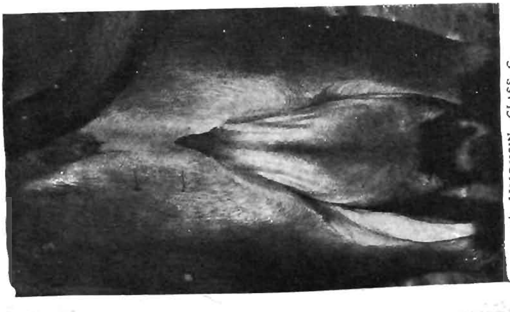
A peculiarity of the escutcheon is that almost invariably the left side is larger than the right; while the tufts and ovals are also more frequently found to the left.

A further peculiarity is that where there is uniformity of breeding in a herd, there will be much more evenness in the variety of escutcheon than among mixed or crossbred stock; though there will be still much variation in the minor characteristics. From this, it is certain that a closer estimate of the maximum yield of an animal should be possible by one who is familiar with the general quality of the strain from which it has descended than by one not acquainted therewith. There are breeds, and strains of breeds, in which heavy milk-production has been given special attention;



20. BICORN. CLASS B.
(d) Left babian tuft.
Yield, 16 qts. (7 mos.).

19. LIMOUSIN, CLASS B.
Yield, 6 qts. (3½ mos.).



18. LIMOUSIN, CLASS C.

and, among animals of those lines of breeding, the daily yield would necessarily be higher than among those that had been bred mainly for rich quality milk.

None of the other standard points of the typical dairy animal should be overlooked when considering the possible milk-production of a cow or heifer from its escutcheon. To attempt to appraise value from this alone would be anything but wise. A cow may have a good escutcheon, but, if her eye and general appearance suggested a sluggish disposition, she might be an unprofitable cow to buy, as she would probably require special feeding to keep her up to her work. Again, in some milking sheds, a cow of nervous temperament might be subjected to conditions which would result in her not milking to anything like her full capacity, as well as drying off much before her natural time; whereas, under more favourable conditions, she would give complete satisfaction. The two-year-old heifer in Fig. 22 is of a most nervous disposition, which probably accounts for her drying off much before the time indicated by her escutcheon. This heifer's mother was also not satisfactory on her first calving, but improved quickly afterwards.

The growth of an animal must always be given consideration when estimating her maximum yield. A cow may show nice dairy type in many sections; but if she has not a robust frame and capacity to consume a large quantity of fodder daily, she cannot be expected to milk heavily. The cow shown in Fig. 2 is rather neatly shaped, with an escutcheon indicating an eighteen-quart maximum and a seven to eight months' milking term. She is, however, a small cow of her breed, with a somewhat stunted appearance, though even. Taking this into consideration, it would not be safe to estimate her capacity as over ten quarts, though it is evident she would hold well to her milking. In actual work, on good feeding, she has given eleven quarts, and milked up to six weeks from calving.

The quantity and quality of food available to the cow has, of course, everything to do with her reaching her possible milk-flow; and, for want of proper feeding, many cows never reach their maximum. With cattle kept under rough conditions, exposed to severe weather changes, and subjected to much fluctuation in the amount and quality of their grazing, the milk flow will be very uneven. In some seasons, they may milk extra heavily and keep the flow up well, on account of favourable conditions prevailing; whereas, in others, they may do badly. Little return can be expected from cows allowed to suffer from excessive cold or heat, or semi-starvation.

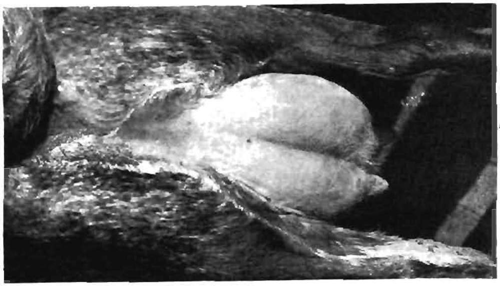
The escutcheon is not confined to one sex. With bulls, however, the Curveline and Horizontal varieties are those most frequently seen; and some show splendid development. Fig. 22 shows a Horizontal escutcheon, A class, on a bull that has proved very successful as a sire of deep milking stock.

Photographs Nos. 4, 7, and 13 are of young heifers; and show that the escutcheon may be made use of in choosing dairy stock at an early age. It should be of particular value to a dairyman raising calves of unknown breeding. A calf with a good escutcheon, if properly raised, will almost invariably make into a good cow; whereas those not having this significant marking well defined are unlikely to be worth rearing for dairy work.

The heifers in Figs. 4 and 13 are aged thirty-two and thirty-three weeks respectively. They are by the same sire, from full sisters. The dam of No. 13 was last year a better cow than that of No. 4 by 90 gallons. The

21. HORIZONTAL, CLASS B.

22 HORIZONTAL, CLASS A.
(Bull.)



23. LEFT FLANDERS, & SQUARE, CLASS B.
Yield, 17 qts. (7 mos.).

former was out of profit 80 days, and the latter 110 days. The escutcheons indicate that the best cow has produced the best calf; for, at maturity, No. 13 should give 17 quarts and hold for seven to eight months. No. 4 has previously been referred to as likely to grow into a 14-quart cow milking six months after falling in calf.

In conclusion, it is the opinion of the writer that while the escutcheon is not to be taken by itself as an infallible guide to milking quality, it is worthy of much closer study than is generally accorded it by dairymen. It is not a subject for any one to take up by itself, under the impression that therein lies the key to successful buying; but, taken in conjunction with type, it will be found of great assistance in making a choice among medium quality stock, and especially among springers or heifers.

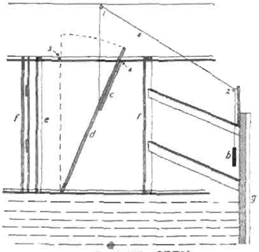
It is no new theory. It has stood the test of time; and, wherever investigated, it has not failed to prove reliable. As far back as 1878, a State Commission, comprised of dairy cattle breeders, was appointed in Pennsylvania, U.S.A., to take evidence on the subject. Over 200 dairy cows were examined; and their estimated yields, as indicated by their escutcheons, were compared with their milking records. The result was that the Commission reported the system to be all that is claimed for it.

To those buying or breeding dairy cattle a knowledge of the escutcheon and its numerous variations is more or less a necessity. Unquestionably it is a guide to dairy value; and, as such, none can afford to overlook it.

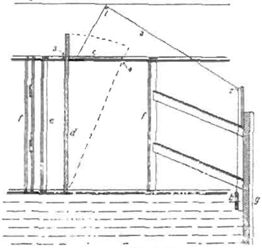
DEVICE FOR OPENING AND CLOSING OF COW-BAILS.

H. C. Churches, Dairy Supervisor.

Many and varied are the devices in use for the opening and closing of cow-bails. Some make up in ingenuity what they lack in workmanship. Many are lacking in both comfort and convenience; others, whilst they are convenient for the attendant, are certainly not comfortable for the cow.



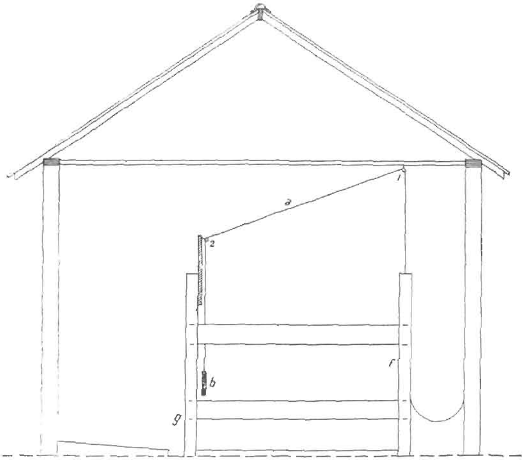
1. BAIL OPEN.



2. BAIL CLOSED.

The dairyman who expects the maximum results from his cows must study their comfort. Only too often does one see the cow's neck jambed against the front division post between the bails, and her leg roped back to the rear division post. Because she moves through being tired of standing on three legs, she receives sundry knocks, and the result is she will not "let down" her milk.

For simplicity of construction, comfort to the cow, and convenience for the attendant, the accompanying illustration of a cow-bail is worthy of consideration. The bail is opened or closed by simply raising or lowering a weight at the rear division post. Walking to the head is thus obviated, the cow being both bailed or unbailed from the rear. In the case of heifers and nervous cows this is certainly a great advantage.



3. POSITION OF LOG-LINE AND WEIGHT. SIDE ELEVATION.

The following are the details of construction:—

1. Small pulley fixed either to rafter in roof or to batten nailed to rafters, and running the full length of shed.

2. Small pulley fixed either to roof of shed as No. 1, or to an extension in height of rear division post as shown.

3. *Small bolt or block of wood to prevent bail-post remaining on dead centre.*

4. Hinge or bolt pivot on cleat or tongue. (*a*) Length of log line or green-hide fixed to cleat or tongue (*c*), thence through pulleys 1 and 2. (Holes in rafters or screw-eyes may be substituted for pulleys). (*b*) Weight (to about correspond with weight of cleat or tongue) fixed to end of line. (*c*) Tongue or cleat. (*d*) Bail-post. (*e*) Extra post to facilitate the security and comfort of the cow. (*f*) Front division posts between bails. (*g*) Rear division posts b tween bails.

Any size timber may be used, according to the opinion of the builder. Although sawn timber is shown in the drawings, it is not essential—split or rough timber will suffice.

The advantage claimed is that the cleat or tongue (*c*), which holds the bail post in position against the cow's neck, drops by gravitation when the weight (*b*) is released. The bail-post (*d*), not being allowed to remain on dead centre by a bolt or block of wood (3), drops back with the tongue or cleat and thus releases the cow.

PASSION FRUIT CULTURE.

J. Farrell, Orchard Supervisor.

Owing to the increasing demand for Passion Fruit (*Passiflora edulis*) the area under passion vines, particularly in the Wandin district, is being considerably increased. There are at present many new blocks of land being prepared for planting, and growers look forward with confidence to the further successful establishment of local and export markets for this fruit.

The crop was heavy this season and consequently prices were somewhat lower than usual at the commencement. Towards the end of the season, however, they recovered to such an extent that, on the whole, growers obtained a fair average return.

PREPARATION OF SOIL.

Soil of a deep loose chocolate nature is the most suitable. The Wandin district is particularly adapted for passion fruit culture. The plants thrive best on new land, and on elevated positions are less affected by frosts than when grown on low lying ones. After clearing operations have been completed, the land should be ploughed and allowed to remain fallow for one year. The following year, prior to planting out, the soil should be well worked and kept free from weeds. When it is intended to plant on land which has been previously cropped, it is only necessary that the soil be kept in a good state of cultivation.

RAISING YOUNG PLANTS.

Young plants are raised from seeds which should be saved from fruit which ripen during May or June. These seeds give a higher percentage of germination than those taken from fruit which ripen earlier. They may be sown during September in pots, boxes, or in drills, and covered with 1 in. of soil. The seeds may be sown thickly; and, when the plants are about 2 in. high, the weaker ones may be thinned out so as to leave a space of about 3 in. between the remaining plants. Growers who determine on extending their blocks rarely find it necessary to sow seed in order to obtain the plants required; a sufficient number invariably grows amongst the old vines, as a result of the falling of ripe fruit. The seed bed should be kept well watered during dry weather.

PLANTING OUT.

The young vines are generally planted out when one or two years old, and usually towards the end of September or early in October, when the frosts have disappeared.

Post and wire trellises, from 5 ft. to 7 ft. high, are erected to support the plants. The posts are made of rough split timber, ranging from 6 in. x 6 in. to 8 in. x 8 in., with four or five wires, ordinary or galvanized, and from 8 to 10 gauge. The posts are usually put 3 ft. in the ground.

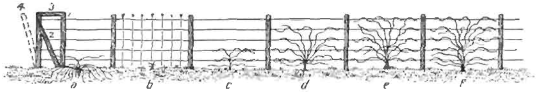
The distances of the trellises apart, also the distances between the posts, are regulated by the method intended to be adopted when planting out. There is a great diversity of opinion among growers as to most suitable distances between the rows and between the vines in the rows. Those mostly adopted by the Wandin growers are 12 ft. x 16 ft., 12 ft. x 18 ft., or 12 ft. x. 20 ft. Others plant 9 ft. x 12 ft. or 9 ft. x 14 ft., but these are too close and do not admit of sufficient light and air, particularly when

the trellises are over 5 ft. high. Last season, a young grower planted 16 ft. x 16 ft., but this method is regarded by the more experienced growers as a waste of ground.

THE TRELLIS.

After giving due consideration to the various methods of planting out, I would recommend 12 ft. x 18 ft., *i.e.* 12 ft. between the rows or trellises and 18 ft. between the plants in the rows. The accompanying rough sketch will serve to illustrate the kind of trellis which is recommended to be used in conjunction with this method of planting. No attempt has been made to draw to scale, nor to draw the plants beyond giving a rough idea of the positions taken up by the leaders.

The trellis illustrated is 6 ft. high with 6 in. x 6 in. posts 18 ft. apart. The end posts are 8 in. x 8 in. The post marked 1 is an extra one and is 8 ft. from the end post. It supports the stay (2). The crosspiece (3) is nailed to it and the end post. When erecting the latter, some growers put it in at an angle, as at 4, but this is unnecessary if the trellis be properly erected. In this trellis 5 galvanized No. 10 gauge wires are shown. A few growers use 4 wires of No. 8 gauge. Although this makes a good trellis I prefer that illustrated.



TRELLIS FOR PASSION FRUIT PLANTS.

Occasionally, growers plant the young vines one or two years before erecting the trellis and allow them to lie on the ground all that time as at (*a*). This method is to be deprecated, as too many light and useless leaders are produced and they must be afterwards cut away when the plant is being put on the wires.

But if the young plant one year old (*b*) is sown at the end of September, when the frosts are over, a fair growth is produced by the following February (*c*). The plant may then be put up. The natural habit of the passion is for its leaders to take hold with their tendrils and climb; by placing them on the wires, Nature is assisted. A plant two or three years old is shown at (*d*). Its leaders are few, but are healthy and strong as compared with (*a*) and its great number of weak leaders on the ground.

Prior to putting the plants on the wires, saplings about ¾ in. in diameter at the butts should be woven about 18 in. apart, one against the other, into the wires, on the principle of wicker work (*b*). The butt ends should be kept uppermost; if put in butt downwards, the vibration of the wires would cause them to drop. The saplings make the trellis firm and afford the plants a support on which to climb from wire to wire.

CULTIVATION AND MANURING.

The soil around the young plants, after planting out, should be kept well worked, so as to destroy weeds and conserve moisture. They should be copiously watered as often as required during dry weather.

A little stable manure should be dug in around the young plants; and, providing the soil be kept well worked, an occasional sprinkling of bonedust or bonedust and superphosphate will be all that is necessary to maintain vigorous growth.

To obtain heavy crops from plants in bearing, intense culture, with a fair amount of manure, is essential. The land between the trellises should be ploughed at least twice a year and harrowed regularly, particularly after rain during summer and autumn. A spring-tooth harrow is very useful for the purpose.

A liberal supply of stable manure, when plentiful, should be given; if not, artificial manure as recommended for young plants should be used at the rate of 4 lbs. per plant or 8 cwts per acre and harrowed in during early spring.

PRUNING.

The vines should not be pruned until the frosts have disappeared. Young plants suffer badly from frost. They should be protected for the first two years by branches of evergreen trees being placed around them; old hessian also serves the purpose. When a young plant becomes frost-bitten, the diseased parts should be removed with a sharp knife; the cut should be made about ½ in. into the sound wood. If any of the diseased wood be allowed to remain, decay continues.

Superfluous wood and foliage should be allowed to remain on the older vines until after the frosts are over, as they help to save the vines. They may then be removed with advantage.

DISEASES.

Old passion vines are very subject to Collar Rot (*Fusarium*). This disease is more easily contracted, and is more difficult to deal with, when the plants are allowed to establish themselves by throwing up a number of leaders from or below the surface of the ground (*c*). The stems should be kept clean and about 3 in. long, like (*f*). This can only be satisfactorily done by putting the plants on the wires while young, and thus rendering the work in connexion with their requirements easy. This disease may be kept in check by scraping off the diseased bark at the collar and spraying with Bordeaux mixture.

Passion plants also suffer from Brown Spot of the leaf and fruit (*Glocosporium*). This disease may be suppressed by thinning out the diseased parts, and by the judicious use of Bordeaux mixture.

The vines suffer but little from insect diseases. Occasionally, the stems and roots are attacked by the White Ant (*Termes australis*). The ants rarely attack young vigorous plants, but confine their attention mostly to old and decaying ones or those which are affected with Collar Rot. Such plants should receive immediate attention, as recommended, when the ants will share the fate of the Collar Rot. If this were found to be ineffectual against the ants, kerosene emulsion might be injected into the diseased parts. Old vines which have ceased to produce remunerative crops through disease or other causes should be grubbed out and burned.

SUPPLEMENTARY LIST OF ARTIFICIAL FERTILIZERS REGISTERED AT THE OFFICE OF THE SECRETARY FOR AGRICULTURE UNDER THE ARTIFICIAL MANURES ACTS.

Description of Manure.	Brand.	Nitrogen.	Total Phosphoric Acid.	Potash.	Price asked for Manure per ton.	Where Obtainable.
		%	%	%	£ s. d.	
Nitrate of Soda	M.L.	15·50	..	..	13 10 0	Mt. Lyell M. and R. Co., Melbourne
Blood Manure	Sickle	7·50	1·00	..	6 0 0	Cuming, Smith, and Co., Melbourne
" "	M.L.	7·50	1·00	..	6 0 0	Mt. Lyell M. and R. Co., Melbourne
" "	Wischer's	7·50	1·00	..	6 0 0	Wischer and Co., Melbourne
Nitrate of Potash	Sickle	13·00	..	46·00	28 0 0	Cuming, Smith, and Co., Melbourne
" "	Wischer's	13·00	..	46·00	28 0 0	Wischer and Co., Melbourne
Muriate Potash	M.L.	..	..	60·00	13 12 6	Mt. Lyell M. and R. Co., Melbourne
Sulphate Potash	"	..	..	52·00	14 17 6	" " " "
Maldon Island Guano, 50%	Sickle	..	22·90	..	3 10 0	Cuming, Smith, and Co., Melbourne
Ground Phosphate, 80%	"	..	36·65	..	5 0 0	" " " "
Guano, 50%	M.L.	..	23·00	..	3 10 0	Mt. Lyell M. and R. Co., Melbourne
Ground Phosphate, 50%	"	..	23·00	..	3 10 0	" " " "
" " 80%	"	..	36·65	..	5 0 0	" " " "
Guano	Wischer's	..	50·00	..	3 10 0	Wischer and Co., Melbourne

Description of Manure.	Brand.	Nitrogen.	Phosphoric Acid.	Mechanical Condition.		Price asked for Manure per ton.	Where Obtainable.
				Fine Material.	Coarse Material.		
		%	%	%	%	£ s. d.	
Bonemeal	Wischer's	3·00	21·00	30·00	70·00	6 10 0	Wischer and Co., Melbourne

SUPPLEMENTARY LIST OF ARTIFICIAL FERTILIZERS, ETC.—*continued.*

Description of Manure.	Brand.	Nitrogen.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Insoluble.	Phosphoric Acid. Total Phosphoric Acid.	Potash.	Price asked for the Manure per ton.	Where Obtainable.
		%	%	%	%	%	%	£ s. d.	
Dissolved Bone and Superphosphate ..	Sickle ..	1·00	10·01	3·88	5·48	19·37	..	5 2 6	Cuming, Smith, and Co., Melbourne
Bone and Superphosphate Mixed (A) ..	" ..	1·50	8·50	0·50	10·00	19·00	..	5 7 6	" " " "
Blood, Bone, and Superphosphate Mixed (B)	" ..	2·63	8·50	0·50	5·50	14·50	..	5 7 6	" " " "
Bone and Superphosphate Mixed (C) ..	" ..	0·75	12·75	0·75	6·00	19·50	..	5 0 0	" " " "
Dissolved Bone and Superphosphate ..	M.L. ..	1·00	10·00	3·75	5·25	19·00	..	5 2 6	Mt. Lyell M. and R. Co., Melbourne
Blood, Bone, and Superphosphate ..	" ..	2·50	8·50	1·00	5·50	15·00	..	5 7 6	" " "
Bone and Superphosphate, No. 1 ..	" ..	1·50	8·50	1·50	9·00	19·00	..	5 7 6	" " "
" " No. 2 ..	" ..	0·80	12·75	1·00	5·75	19·50	..	5 0 0	" " " "
Dissolved Bone and Superphosphate ..	Wischer's ..	1·00	10·01	3·88	5·48	19·37	..	5 2 6	Wischer and Co., Melbourne
Blood, Bone, and Superphosphate ..	" ..	2·63	8·50	0·50	5·50	14·50	..	5 7 6	" " "
Bone and Superphosphate, No. 1 ..	" ..	1·50	8·50	0·50	10·00	19·00	..	5 7 6	" " "
" " No. 2 ..	" ..	0·75	12·75	0·75	6·00	19·50	..	5 0 0	" " "
Bone Fertilizer	F. Bugg ..	3·58	..	5·67	15·78	21·45	..	6 0 0	S. and F. Bugg, Kyneton
" "	Hoskin's, Eagle Point	3·36	..	6·66	12·84	19·50	..	5 10 0	E. T. Hoskin, Bairnsdale
" " A	M.L. ..	5·00	..	3·00	13·00	16·00	..	6 15 0	Mt. Lyell M. and R. Co., Melbourne
" " B	" ..	3·50	..	3·50	15·50	19·00	..	6 7 6	" " " "
" " C	" ..	3·00	..	3·50	14·50	18·00	..	5 17 6	" " " "
" " D	" ..	5·00	..	2·60	11·40	14·00	..	6 7 6	" " " "
" "	Ark	3·72	..	3·98	12·90	16·88	..	6 0 0	A. Murphy, Ararat
Maize Manure	M.L. ..	3·00	11·00	1·25	1·75	14·00	1·00	6 0 0	Mt. Lyell M. and R. Co., Melbourne
Tomato Manure	" ..	4·00	11·00	0·75	1·45	13·20	8·25	8 0 0	" " " "
Vine Manure	" ..	2·35	13·00	0·75	1·50	15·25	7·20	7 0 0	" " " "
Special Lawn Manure	Wischer's ..	0·75	9·80	0·75	5·95	16·50	3·00	5 0 0	Wischer and Co., Melbourne

P. R. SCOTT,
Chemist for Agriculture.

Government Agricultural Laboratory,
Melbourne, 4th August, 1911.

TOBACCO CULTURE.

(*Continued from page 544*).

T. A. J. Smith, Tobacco Expert.

TYPES OF TOBACCO FOR MARKET.

In Victoria, at the present time, there are comparatively few types of either pipe or cigar tobacco produced; but, as new districts are proved suitable for the growth of tobacco, further types, that will be peculiar to themselves in certain characteristics and have a value of their own for purposes such as wrapper leaf, flavour, or special suitability for some particular purpose, are likely to be found. Different soils and climates produce different types of tobacco; and, as with wines, districts become renowned for their type.

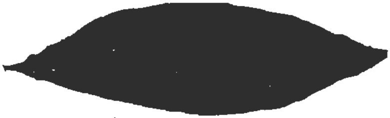
The term "type" must not be confused with the class or grade. Type means a tobacco with a combination of qualities such as colour, body, flavour, strength and stretch, or a tobacco cured by a particular method, such as flue-cured, sun-cured, or air-cured. "Class" means that it may be of value for smoking, chewing or snuff; while "grade" means the different degrees of quality in each type or class such as firsts, seconds and thirds, up to twelve. The tobacco industry in this State produces only three types of plug and cigar leaf, but others will come as the crop is established in new districts, provided that the right varieties are grown, and treatments adopted to suit the prevailing conditions. As each type gets a reputation for being useful for certain purposes its market value increases and becomes of great regularity, thus insuring to the grower a more reliable income.

The photograph of the "Hester" leaf on page 607 is that of a Victorian-grown sample of a type best suited for plug tobacco; it is useful for plug binder or filler and, if of first class quality, sometimes used for wrapper. It is a good shaped leaf, with little waste in cutting, and is an easy plant to handle in the field. "Lax" is another class of plug leaf. It is a leaf of lower quality than the Hester, but is a heavy yielder, the leaf being fitted chiefly for plug filler. Both of these varieties do well under varying conditions of soil and climate; but the qualities will not be the same, which means they are of different class and of many grades.

In cigar leaf, the buyer is chiefly concerned with the colour, feeling, flavour, texture, combustion and general appearance of the leaf, according to the purpose for which it is required. As in filler leaf, colour or appearance is not of so much importance, though texture is of value; flavour and burn are the main considerations. The bunch-wrapper, that is, the leaf immediately under the cover, requires to be sound, without holes; but it must also have strength and stretch sufficient to allow it to expand and contract without breaking under the changes of temperature to which it may be subjected. Flavour is not always a consideration, but is sometimes taken into account as a blend. Appearance is not of great moment. In cover-wrapper leaf, however, appearance is most important. The leaf should have a nice colour and silky appearance and fine texture; it must also have strength and stretch, fine veins, and be able to stand the changes of weather. Sumatra leaf is so thin, and yet so strong, in texture, that 1 lb. will wrap 500 cigars. Flavour is of no great value in cover-wrapper, but the burn must be good.

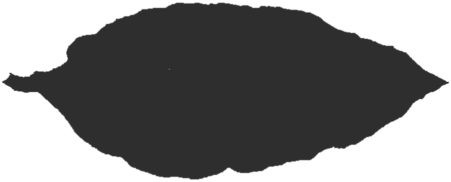
There are various classes and grades of wrapper leaf. An illustration of "Comstock," grown in Victoria, appears on this page.

Each country has its preference for different types of leaf; and, unless the type wanted is obtainable, no business results. There is a wide open-



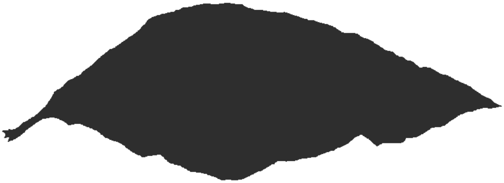
"COMSTOCK" (CIGAR).

ing in Victoria for tobacco-growing, provided the leaf is produced with care and due regard is paid to special types. A nondescript tobacco is always hard to place, and is of low value—it must be regraded and is only purchased as a stop-gap or to work in on a small percentage with other leaf. There is every prospect of special types being grown here, but



"HESTER."

years of careful experimental work will be necessary in the various districts to prove them, unless a lucky hit is made, as sometimes happens. There is an immense market all over the world for a great number of types and various classes but, as previously mentioned, the popular taste is year by year trending towards the lighter aromatic tobaccoes, and these can only



"LAX."

be grown on soils that are not too dark and rich; the richer the soil, the greater the nicotine content, and more rank the tobacco.

The colour of a cigar or plug of tobacco does not determine its strength, as the wrapper constitutes only about 5% of a cigar, the interior being the real influence in this respect. Heavy pressure will turn light

leaf a dark colour, as will also the different preparations a leaf undergoes. The colours under which the cigar wrappers are known are:—

Claro, Very light brown.
Colorado-claro, Light brown.
Colorado, Brown.
Colorado Maduro, Dark brown.
Maduro, Dark.

Our local markets are good enough at the present time, prices ranging for plug leaf from 4d. to 9d. per lb. The supply for this class of leaf is not likely to overtake the demand for some years at least. Seeing that yields of cured leaf average 1,000 lbs. or more per acre of first grade plug leaf, the profits are considerable, being anything from £20 to £75 per acre.

TYPE OF PLUG TOBACCO.

TYPE OF CIGAR TOBACCO.

In comparison with plug leaf, only a small amount of cigar leaf is used in Victoria. Prices have reached 1s. 6d. per lb. As the yield is from 700 to 1,400 lbs. per acre, the profits are high, but the leaf must be good. It is more difficult to produce good cigar leaf than plug; greater care is also required in growing, curing, classing and fermenting, and quality such as fine texture, fine vein, and special flavour must be obtained in order to command a market.

It is therefore advisable to begin with a plug tobacco and experiment with cigar varieties in a small way until it is proved that good cigar leaf can be grown. It must be remembered, too, that cigar tobaccoes entail more labour than plug, owing to the additional treatments necessary and the extra number of plants per acre there are to handle.

Diseases and Pests.

Fortunately, the Victorian tobacco grower is not assailed by diseases and pests to the same extent as the American, though as time progresses some of them will probably be introduced. The fact that the seed is used in comparatively small quantities and is kept in sealed jars will tend to minimize the introduction of diseases and pests. Our drier atmosphere is not so conducive to the worst diseases that American growers have to combat—and that factor will save us much trouble.

Up to the present, our worst enemy has undoubtedly been the disease known locally as Blue Mould (*Hyoscyami perenospora*), a fungoid growth that attacks the young plants in the nurseries generally before they are ready for transplanting. It is worse in or after wet seasons when the first warmth of spring is felt (Rusty seasons for wheat are generally bad for Blue Mould). It makes its appearance in the initial stages, under the leaf of the plant, in small round spots the size of a threepenny piece. These, on examination, are seen to be covered with a grey-blue mould, hardly discernable to the naked eye and resembling a light fur. If not checked by natural or other causes, the spots increase rapidly in size and the plant dies in five or six days. In some cases, a mild attack only takes place and the plant recovers. When a fresh growth of the heart and root takes place, the plants can be put out with safety, but if no fresh growth is made the labour of transplanting will be wasted. A test is often made by pulling up a few plants and cutting across the stem just above the roots and below the leaves. If a black ring is found right round the plant just inside the bark, the plants should be abandoned; if the ring is faint, or only partially round the plant and the fresh growth spoken of can be discerned, they can be put out in the field. Cold changes followed by muggy weather are conducive to this disease and care should be taken during such weather to give as little water as possible. The frame beds protect the plants from the wind and maintain a more uniform temperature than the open beds and are to be recommended for this reason. They also prevent the loss of moisture by evaporation and so save the necessity for watering to the same extent as is necessary with open beds.

Various methods of treatments for the prevention and cure of this disease have been tried but no specific cure has yet been found. Lime, sulphur, Bordeaux mixture, and other sprays have proved of little effect. Treating the soil with steam carbon bi-sulphide and formalin has shown slight results, but if persisted in will kill the plants. Fumigations with sulphur and formaldehyde candles have also checked the disease in the early stages, but have no good effect in a bad case.

The most successful method yet employed is in sowing relays of beds at monthly intervals from August to November, so as to have beds coming on that will probably miss the critical time for the moist season. Plants will be obtained more quickly from beds sown late than from the early beds—in many cases, in six weeks; and, if transplanted before the end of the year, will produce a crop. As a matter of fact, the late planted crop, though returning a lighter yield, will give far less work in working the land, weeding, &c.; also, the quality of the leaf from the late crop is

generally better, provided the land has been kept in good order, clean, and the surface kept broken to conserve the moisture. Only once in 30 years' experiments have I had a total failure in following this method, though mould has appeared to some extent almost every year. The work of attending the beds is slight and does not entail such sacrifice of time, or labour, if as much, as three times the actual quantity of beds required is sown.

Cut Worms are troublesome in some cases, and attack the young plants as soon as they are transplanted. Clean cultivation during the autumn and winter will go far to ridding the field of this pest. If they are still found in the soil, a mixture of arsenic, 1 part, to flour or bran, 20 parts, with sugar or molasses sufficient to sweeten the mixture will, if placed about the plants in the evening, kill them. Care should be taken to spread the baits about sundown, as the cut worms come out in the night and will not take the baits if dry.

Grasshoppers are at times a nuisance. Paris green, 1 part to 20 parts of flour, will, if dusted on the plants, kill these pests. The same treatment will be found effective for the green caterpillar which attacks the plant, the best way in which to administer the poison being from a muslin bag on the end of a stick. The bag is held over the centre of the plant and the stick tapped when the powder will be well sprinkled over the heart of the plant. A very little will be sufficient and it is not wise to apply as much as will whiten the plant.

The Tobacco Miner, so named on account of the way in which it burrows between the outer skins of the leaf, is difficult to cope with. Cleanliness in working the land, and burning all affected leaves to destroy the larvæ, is the best remedy. No treatment has so far been found effective.

The Flea Beetle, Wire Worm, Pole Burn, and other troubles of this kind, do not appear to have affected tobacco in Victoria.

FARM BLACKSMITHING.

(Continued from page 549.)

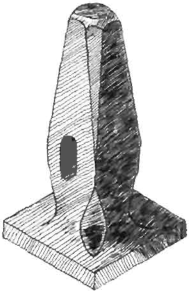
George Baxter, Instructor in Blacksmithing, Working Men's College, Melbourne.

III.—TOOLS.

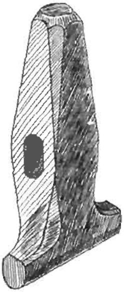
Having fitted up the forge satisfactorily the next consideration is tools. It will be necessary to purchase a certain number, and with these all others may be made, providing sufficient skill be attained. It will be understood from this that all blacksmith's tools and, in fact, the tools of all trades, are with few exceptions made by blacksmiths, so that volumes might be written on tool-making alone. The tools used by smiths are countless, as special tools are made to suit special cases; and, in many instances, before a job can be carried out, the requisite tools must first be made.

The accompanying sketches show the least number of tools to begin with. They would cost about £1 5s.—a comparatively slight amount when the time they will last, together with the variety and amount of work that may be done with them, is taken into consideration.

No. 12 is called a *flattener*; and, as its name implies, is used for producing flat surfaces. No. 13 is a *fuller*, and is used for many purposes, amongst which scarfing iron preparatory to welding is the most important. The *hot-sett* (No. 14), or hot chisel as it is sometimes called, is for cutting hot metal, whilst No. 15 shows a *cold-sett* for cutting cold bars. It will be noticed that the angles of the blades are different, that of the hot-sett being much thinner than the cold so as to enable it to be easily driven into the heated metal; the difference in the hardness of the hot and cold iron makes this possible.



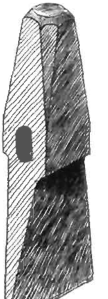
12. FLATTENER.



13. FULLER.

No. 16 is a *hardee*. It is practically a chisel used upside down, and is one of the most useful tools. The manner in which it is applied is to fit it into the square hole of the anvil, place the material to be cut on top of the cutting edge at the desired position and strike immediately opposite with the hammer. It will be understood that only light bars are to be cut with the hardee. The heavier ones are cut with the cold or hot setts, according to the temperature of the metal. The use of the hot and cold setts requires the united work of two persons, one to hold the metal in one hand and the tool in the other, while the other person strikes with the sledge hammer. When the work is not heavy one individual may, by using the hardee, perform a vast amount of work without assistance.

A *hand hammer* (No. 17) requires no further remark than that the most useful weight is about 1½ lbs. No. 18 illustrates the usual form of a *sledge hammer;* one weighing about 10 lbs. would be best for the purpose intended. The *swage* (No. 19) is used for forging metal circular. It is used in conjunction with a swage block or with bottom swages made to fit the anvil.

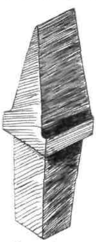


14. HOT-SETT OR HOT CHISEL.

15. COLD-SETT.

For the farmer, the swage block will be the most useful and, at the same time, cheaper than a set of bottom swages; for that reason, no bottom swage is shown. The *swage block* (No. 20) is made of cast iron and is a combination of many tools. All the swages that will be needed, as well as hexagonal shaped tools for forming nuts and bolt heads, are placed on

the four sides of the block. There are also a number of differently shaped holes running through it which are used for numerous purposes. It costs approximately £1 per cwt. One weighing 1 cwt. will be ample for the requirements. The *hand punch* (No. 21) is about 8 in. long and is tapered to ¼ in. diameter at the point. This is a very convenient size, although other sizes and shapes are made. It is used for making holes in cold or hot metal. If the thickness does not exceed ⅛ in. it is punched cold, as in the case of making a hood and chimney for the forge; but above that thickness the metal should be heated.

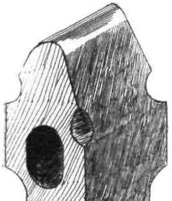


16. HARDEE.

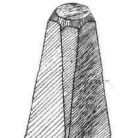
17. HAND HAMMER.

The *centre punch* (No. 22) is for marking positions on metal. In drilling holes, it is essential that a centre mark be made, so as to start the drill at the correct place. Likewise, when a hole is to be punched in hot metal the position is first marked with the centre punch; the iron is then heated and the hole driven through. If the holes were marked with a pencil or with chalk, the marks would become obliterated when heated.

The various tongs shown are: *Flat tongs* (No. 23), *hollowbits* (No. 24), *pliers* (No. 25), and *pincer tongs* (No. 26), are about the most useful shapes to start with. The flat tongs, by having a groove along the centre of the jaws, will hold small round or square iron as well as flat. A pair made to grip ¼ in. flat will hold ¼ in. or ⅜ in. round or square. The hollowbits are designed to grip round metal, but they will hold square or flat as well. It would be best to get a pair to hold ¾ in. diameter; they may then be used for holding ¾ in. or ⅝ in. octagonal steel, or ⅝ in. round or square iron. The pliers are called by some "the handy tongs," because they will catch hold of so many different shapes and sizes. They can be made to pick up a pin; and, without any alteration, will fit around an object measuring 3 in. diameter with the larger bow and 1 in. diameter with the smaller. The pincer tongs are of a shape that can be used for many jobs. They hold bolt-heads, round or square iron from 1 in. to 1¼ in., the heads of tools, chisels, &c.



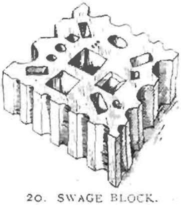
18. SLEDGE HAMMER.



19. SWAGE.

The remaining tools required are as follows:—Flat and half round bastard cut *files*; several round and square files of assorted sizes; a *rule* (a brass one costing 1s. is to be preferred to any other, because it is not injured when measuring hot iron—it will not burn like a wooden one or

rust the same as a steel one); one or two pairs of cheap *calipers* for correctly measuring sizes, particularly circular work; a pair of *compasses*; several *spanners*, or nut-wrenches; and a set of *stock dies and taps* for cutting screws. These are rather expensive;



21. HAND PUNCH.

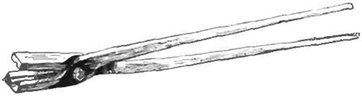
20. SWAGE BLOCK.

22. CENTRE PUNCH.

a full set would be about £5, but a set of say $\frac{1}{4}$ in.; $\frac{3}{8}$ in.; $\frac{1}{2}$ in.; $\frac{3}{4}$ in.; $\frac{7}{8}$ in.; and 1 in. should be quite sufficient for all the requirements on a farm.

MATERIAL.

A small stock of bar iron and steel consisting of the undermentioned size will be sufficient to begin with and will cost at the rate of from £10 to £14 per ton for iron and mild steel, and 4d. to 6d. per lb. for cast steel. A bar of each only should be obtained—1 in. x $\frac{1}{4}$ in.; 1 in. x $\frac{1}{2}$ in.; $\frac{1}{4}$ in.; $\frac{3}{8}$ in.; $\frac{1}{2}$ in.; $\frac{5}{8}$ in.; $\frac{3}{4}$ in.; 1 in. round and square iron; $\frac{3}{4}$ in. octagonal cast steel; $\frac{3}{4}$ in. and 1 in. mild steel.

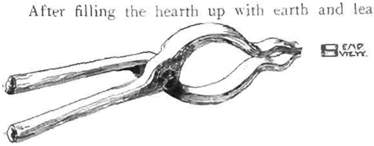


23. FLAT TONGS.

24. HOLLOWBITS.

LIGHTING THE FIRE.

After filling the hearth up with earth and leaving a hole directly in front of the tue-iron, as previously instructed, the fire may be lit. To do so get a handful of shavings, papers, straw, &c.; or, better still, a shovelful of fire from the kitchen and place immediately in front of the tue-iron. Blow the bellows gently and fill in the space with whatever fuel is available. If coal is used it should be very small and should be wetted before putting on the fire to prevent it blazing up too quickly.



25. PLIERS.

With a bellows forge, when coal is used as fuel, care must

26. PINCER TONGS.

be exercised to prevent the bellows bursting. This can happen if blowing be discontinued before the coal becomes thoroughly ignited. The pressure of the atmosphere, acting on the heavy combustible gases, drives them back into the bellows; and, when they join with the air confined within, form an explosive which becomes ignited by the fire and often results in the bellows being blown open. To guard against this disaster, blowing should be continued until the coals directly above the nozzle of the tue-iron become bright, when it may cease without any possibility of injury. A good safeguard is to loosen the coal with the poker occasionally whilst blowing, which prevents it forming a crust, and allows a free passage for the air to pass through.

In quenching the fire, the same thing may happen if there be a good body of fuel above the tue-iron. The action of the water on top of the fuel causes the gases generated by fire and water to be forced into the bellows. As a preventive, take the rake and clear the fire away to one side, leaving the nozzle in view; then throw on the water.

SOME FUNDAMENTAL PRINCIPLES.

Previous to describing the process of making some useful article, it might be as well to mention that, in order to achieve success in the art, there are several fundamental principles that must be fully recognized. The usual idea of the ordinary layman that a blacksmith is one who makes iron red hot and hammers it into shape is only partly true; and, if accepted by any one and applied, failure and disappointment will be the outcome.

Blacksmithing is undoubtedly a difficult trade to learn, which is due to the fact that it requires originality, quickness of thought and action, determination and sound judgment. To acquire proficiency one requires a knowledge of mathematics, an intelligent understanding of the nature of the metals used and the effect that heat and hammering have on them, and long practice.

It is not the intention to deal minutely with all the intricacies of the trade or enter too far into detail, but rather to carefully select objects which, whilst having a direct application to farm work, will at the same time possess educational value which will enable one to apply the knowledge so gained in the accomplishment of requirements other than those dealt with here. That it would be impossible to describe all the work likely to be required by the farmer in connexion with the repair of all his implements will be recognized and admitted. It is, however, hoped that the information given in these articles will have beneficial results.

The materials used in blacksmithing are wrought-iron, mild steel, and cast steel.

Iron is used principally where welding is necessary, as in the case of links of chain, hinges, bolts, &c. In its nature, iron is fibrous like timber. The fibres run longitudinally. It can be bent, twisted, or punched, either cold or hot; it can be welded simply by the application of heat and pressure without the use of solder, fluxes, or glue, as in the case of other metals or wood; and, at suitable temperatures, it can be beaten into any conceivable shape without loss of strength.

The effect of heat on iron is to soften it; and, when the temperature is raised to 2,700 deg. Fahr., it becomes in a plastic or soft and sticky condition, in which state it may be joined together. When the heat is increased to about 3,000 deg. it melts.

In working iron, it is not always necessary to raise to the welding heat. Such operations as punching, bending and twisting are performed whilst

red hot without injury to it: but, if it is required to reduce the size of the metal to any great extent, then the welding heat must be employed, otherwise the fibres of the bar become separated. Reducing the size is called *drawing out.*

The welding heat is recognized by the colour the iron assumes. As the temperature increases, the metal first becomes dark red, then light red, orange, and finally sparkling white. No instruments are needed to register the heat, the colours alone enabling one to judge by sight. In no case should iron be allowed to remain in the fire after the welding point has been reached, because it becomes burnt and wastes away.

Mild Steel is practically iron, but is produced by a different method to the wrought iron. It is of a granular structure and possesses greater strength than wrought iron. It can be welded, but requires greater skill to do so. Mild steel is largely used for all structural purposes, on account of its great strength. It can be bent, twisted, and punched, the same as iron, but is harder to work. One advantage to blacksmiths is that mild steel will not split like iron, if hammered out at a lower temperature than the welding heat.

Cast steel is produced by chemically combining carbon and wrought iron, which entirely alters its nature. It becomes granular in structure, and has a greater strength than mild steel or iron. It possesses the property of becoming hard if suddenly cooled, which property makes it so valuable for the manufacture of tools. It is unlike iron and mild steel, inasmuch as it cannot be welded, excepting when of a low grade and even then great skill is requisite. When dealing subsequently with the manufacture and repair of tools a great deal more information will be given concerning the effect that heat and cooling have upon it.

(To be continued.)

SPRING MANAGEMENT OF BEES.

F. R. Beuhne, Bee Expert.

During the first or second week of September, all hives should be examined for the purpose of seeing whether each one has sufficient food, a laying queen, and enough bees to enable it to work up into a profitable colony.

This examination should be made only on fine mild days, otherwise harm will be done to weak stocks, by letting the warmth escape when opening the hive and by causing the bees to fly and become chilled. Having lighted the smoker, blow one or two whiffs of smoke in at the entrance, lift the cover at one end, and blow a few puffs of smoke over the top of the frames. When quilts are used between covers and frames, hives can be opened with less disturbance, less smoke is needed, and it is consequently easier to find the queens.

The amount of stores is the first consideration at this time of year, but no hard and fast rule can be laid down as to the actual weight of honey required to maintain and develop the colony. The quantity depends upon the number of bees in the hive, the length of time which may elapse before they can find sufficient new nectar in the blossoms of the immediately surrounding country, and the weather conditions prevailing during the following four or five weeks. In no case, however, even under the most favourable circumstances, should there be less than 5 lbs. of honey (equal to

one well filled Langstroth comb) in the hive. Bees build up in spring on their winter stores, excepting in specially favoured localities with a mild climate and an early flowering flora. From 15 lbs. to 25 lbs. of honey is more like the quantity required in an average locality, to obtain the best results in brood-rearing till sufficient new nectar is available from outside sources. In many instances, bees will be found very short of stores this spring; and, as the consumption greatly increases as soon as brood-rearing commences, any shortage should be made good by feeding sugar syrup as recommended in the July number of the *Journal*.

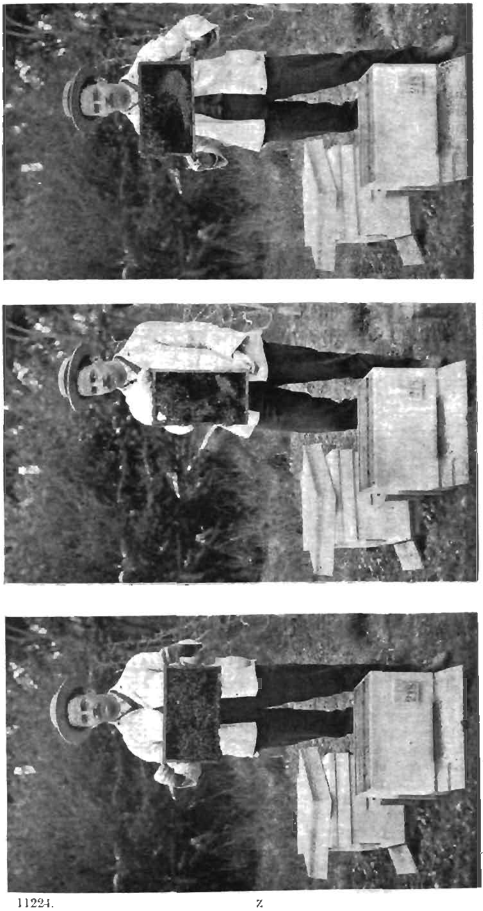
If no feeders are on hand, a clean empty comb may be filled with syrup by placing it flat in a milk or other suitable dish and pouring the syrup into the cells from a height of about 15 in. When one side is filled, the comb is turned over and the other side filled. To get a fine stream of syrup, a jug with a rather pointed lip is the most suitable vessel. When the comb is filled, it should be held or suspended over the dish for a short time, to allow the surplus syrup to run off. The latter would otherwise fall on to the floor of the hive and in all probability attract robbers.

Every hive should have a fertile queen; and, as a minimum, bees on at least two or three combs. It is not absolutely necessary to see the queen, the presence of eggs and of brood in the several stages being sufficient evidence that the queen is all right. When the eggs, however, are at the side of the cell bottom, and not in the centre, laying workers instead of a queen may be present.

A further indication of laying workers, an unfertile young queen, or an exhausted old one, is that the cappings of the sealed brood, instead of being only slightly oval, are hemispherical and project much beyond the general surface of the comb. This is due to the fact that the eggs of laying workers and unfertile or exhausted queens produce drones only. The larvæ of the latter are larger than those of workers and being in worker instead of in drone cells there is not sufficient depth, and the cell is therefore lengthened in capping it. If a hive in this condition still contains sufficient bees, and is to be retained as a separate stock, the laying workers or the drone-laying queen must be replaced with a fertile one. With Italian bees, which are quieter than blacks, and the queen differently marked from the workers, the queen is usually easily found. Black queens are often very hard to find on account of their sombre colour and the habit of black bees of clumping or running off the combs when disturbed.

In hunting for queens, or examining brood for disease, it is necessary to see both sides of each comb. To do so, many bee-keepers turn the comb in the wrong way, resulting in a fracture of the cells near the top bar when the comb is not built right down to the bottom bar and it is at all heavy with honey. It also causes spilling when the comb contains new thin honey. A comb should never be turned on a horizontal, but always on a vertical axis. Combs fractured or strained through handling them the wrong way often mash up in the extractor. When the combs are returned to the hive the bees repair them; but, as the damaged cells become elongated through the weight of the comb, they are large enough for drone-brood, several rows of which will be found across the comb where it was fractured when the comb is used in the brood-chamber. Combs so damaged are also very liable to come down in hot weather or in moving bees by road or rail.

If combs are handled the right way, no harm will be done to them, even when built from starters and not fastened to the bottom bar of the



THE CORRECT METHOD OF HANDLING COMBS.

1. First position. 2. Second position. 3. Third position.

frame. As bees generally, and queens in particular, run to the bottom of the frame when it is lifted out of the hive, it often becomes necessary to turn the frame upside down when looking for the queen. In Fig. 1 is shown the first position; to turn the frame upside down without damaging the comb the top bar of the frame is brought into a vertical position as shown in Fig. 2; and by swinging the frame halfway round (like a door on its hinges), and then bringing the top bar into a horizontal line, the frame is completely reversed as shown in Fig. 3. As the bees again travel downwards, the queen, if she is on the particular comb, will be noticed. To return the comb to the hive the same movements are again gone through, but in the reverse order of 3, 2, 1.

If, in the course of the first examination, one or more colonies are found with unfertile queens, the hives should be marked and left alone till the overhaul of all of the colonies is completed. Amongst a number of stocks of bees there are generally, at this period of the season, some which are weak in bees, though possessing a fertile queen. These queens may with advantage be used to replace unfertile ones in colonies with more bees. To transfer a queen, it is first of all necessary to find and remove the one which is to be replaced. The following day, preferably towards evening, the small stock with the fertile queen is placed alongside. Both lots are gently smoked and the combs with brood and bees from both put into one hive, so that each comb from one is between two from the other hive. The outside combs of both are put into the other hive body which is placed on top of the first, the bees brushed off the combs, and the latter and the hive body removed. If uniting is done later in the season, the second body and combs may be left on as a super.

When no small stock with a laying queen is available, a colony with an unfertile queen may be kept going by giving it a comb of eggs, or young larvæ from a normal colony, once or twice a week, according to the number of bees. At the same time, remove one of the combs of drone larvæ and substitute it for the comb removed from the normal colony which will usually throw out this useless brood. In this way, a colony may even be gradually built up; and, when young queens are available from swarmed stocks, the valueless queen can be replaced.

It is often very difficult to get a colony with laying workers to accept a queen, all the bees being old; but, if treated as described, there will soon be a sufficient number of young bees and the introduction of a queen may then be safely accomplished. Colonies found queenless, and without even laying workers, should be dealt with in the same way, if still sufficiently strong enough to be worth saving.

A mistake, often made by beginners, and even by established bee-keepers, is the spreading of brood with the idea of hurrying brood-rearing. This practice of putting empty combs, or even partly filled ones, between the brood combs, more often results in loss than in gain. It is recommended in some of the text books written for countries in which the sudden changes of temperature experienced here do not occur. During September and October, colonies have all the brood they can cover on a cold day, and spreading the combs by putting a vacant one in the middle results in the brood in some of the outside combs perishing from chill. If it appears necessary to give room for brood, the combs should be placed, one at a time, alongside, and not between, the brood.

(To be continued.)

THE ABSORPTION OF FOOD SUBSTANCES AND POISONS THROUGH LEAVES.

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist and Professor of Botany and Plant Physiology in the Melbourne University.

It has hitherto been generally accepted in Plant Physiology that the leaves of flowering plants are organs specially adapted for carrying out gaseous exchanges with the atmosphere, and that they have comparatively little power of absorbing either water or solids which may be dissolved in water wetting the surface of the leaf. In the case of such plants as mosses, lichens and in the leaves of carnivorous plants, however, a very pronounced power of absorbing water and dissolved solids is shown. The same, of course, also applies to the leaves of water plants which grow completely submerged in water. In fact, whether a leaf will be able to absorb water and dissolved solids, or not, depends mainly upon the thickness and character of the outermost layer or skin, known to botanists as the cuticle. This varies greatly in its thickness and impermeability to water, according to the kind of leaf or the conditions under which it has grown; but, even in the case of a leaf like that of the beech which has a fairly well developed cuticle, a simple experiment suffices to show that solids can be absorbed directly through the outer surface of leaf. For instance, if a drop of a very dilute solution of potassium nitrate be placed upon a beech leaf and covered with a small bell-jar so as to check evaporation, when the drop finally disappears no crystals are left behind on the surface of the leaf; whereas, if the drop is allowed to evaporate rapidly, a little crystalline efflorescence is left behind, owing to the fact that the salt had not time to be absorbed before the water had evaporated. Of course, in a condition of Nature, rain water usually does not contain more than traces of dissolved salts and usually does not remain long in contact with the leaf. Nevertheless, some recent investigations published in the *Mitteilungen der Deutschen Landwirtschafts Gesellschaft*, 1911, page 231, by Professor Hiltner, Professor of Agriculture at the University of Munich, seem to show that quite appreciable quantities of both food substances and poisons may be absorbed by the leaves when such substances are sprayed on the foliage, either dissolved in water or in suspended form.

Some instances of this power of absorption through the leaves, have long been known. For instance, if the leaves of a plant happen to have become pale coloured, as sometimes occurs owing to a deficiency of iron in the soil or to a difficulty in absorbing it, then merely painting the pale surface of the leaf with a dilute solution of chloride of iron will restore the green colour temporarily or permanently to the leaves so treated. Another instance, in this case of the absorption of a poison, is the well known use of copper sulphate to keep down Charlock or Wild Mustard in cereal crops. The copper sulphate solution adheres long enough to the Charlock leaves to be absorbed by them and to cause their death, whereas the solution runs off the grass leaves without affecting them to any appreciable extent. Professor Hiltner's experiments seem mainly to have been directed towards determining whether it would be possible by spraying potassium salts on the leaves to obtain a more rapid response than if the salts were applied to the soil. Critical experiments were performed with mustard and soy beans from which it appeared that neither nitrogenous food

(nitrates, ammonium salts, asparagin) nor phosphoric food (superphosphate, basic slag), could be absorbed through the leaves in sufficient quantity to make good a deficiency in the soil, however carefully and thoroughly these substances were applied to the leaves. In fact, if superphosphate, for instance, was applied to the leaves in the form of powder, it was found to destroy them almost entirely. On the other hand, it appeared that potassium salts could be absorbed readily through the leaves of mustard plants in the form of potassium sulphate, and preferably as potassium chloride in the case of the soy beans. This was evidenced by the weights obtained in the following pot experiments:—Without potassium the yield was 15 grammes; with chloride of potassium applied to the soil, 38 grammes; with chloride of potassium sprayed on the foliage, 43.5 grammes; with potassium sulphate applied to the soil, 45.5 grammes; and with it sprayed on the foliage, 43.5 grammes.

Proper care seems to have been taken to insure that the salts brushed or sprayed on the leaves did not reach the soil. It is, however, too early to say whether these results may prove to be of practical importance in agriculture, but they are to be continued, and may ultimately prove to be of great value. It might, in fact, be found in some cases that spraying the foliage of a crop with a dilute solution of a potassium salt might just give it the required fillip at a critical stage of its existence and enable it to make good a previous deficiency or to overcome a threatened attack of disease. If such results can be obtained with food substances in the form of sprays, they would of course be preferable to poisonous sprays, provided they were equally effective.

Professor Hiltner also gives the results of spraying Magnum Bonum potatoes that were badly attacked by Leaf Curl disease (*Macrosporium Solani*):—

Plot.	Weight of Tubers in *kilogrammes.*	Percentage of Starch.
Unsprayed	115·7	15·7
Sprayed with Potassium Nitrate solution ...	135·3	14·8
" " Kainit solution ...	153	15·2
" " Magnesium Sulphate solution ...	124	15·2
" " Sulphate of Iron solution ...	91	15·1
" " Milk of Lime solution ...	112	15
" " Humus solution ...	141	15·4
" " Bordeaux Mixture ...	144	14·5

The above solutions were applied in 2 per cent. strengths with the exception of the sulphate of iron (1 per cent.), and the milk of lime (4 per cent.). It can be seen that five of these spraying materials increased to a greater or lesser extent the yield of potatoes and two produced a decrease, but that all of them caused some decrease in the percentage of starch as compared with the unsprayed plot.

It is evident that a great field for work lies open in the direction indicated above and the further results of Professor Hiltner's researches will be awaited with interest.

THE SOY BEAN.

Victor Deschamp, Analyst, Agricultural Laboratory.

Despite the favourable reports published in numerous scientific and trade publications throughout the world, the cultivation of the Soy Bean has not yet been seriously undertaken in Victoria. Although it is unlikely that the bean can be grown in this State cheaply enough to compete with the Chinese product, principally on account of the difference in the cost in labour, it should be a remunerative crop. As a fodder crop, as a soil renewer, and as a green manure, it has been successfully grown in countries other than its native habitat and under varying climatic conditions. As there are over 300 known varieties and hybrids, some of these should be suitable for different parts of this State.

ECONOMIC USES.

The home of the Soy Bean is in Manchuria and Japan and has been grown there in large quantities for centuries, but until a few years ago no attempt was made to grow it elsewhere on a commercial scale. In the countries named a small part of the oil, 6 to 8 per cent. only, was extracted by primitive presses, and the residual oil cake used as a fertilizer. The imports of cake to Japan in 1905 were 182,000 tons, while in 1909 the enormous amount of 600,000 tons was exported to Japan alone, showing that its use as a fertilizer is greatly on the increase, in spite of competition with artificial fertilizers. The estimated total crop in Manchuria for 1909 was over 1,500,000 tons of shelled beans. The photographs reproduced on the following page will give some idea of the export trade at Darien (Manchuria) during that year.

The first large cargo of soy beans consigned to England arrived in Hull in March 1909, and amounted to 5,200 tons, and before July of the same year, contracts had been made for the delivery of no less than 200,000 tons, to be utilized for oil extraction and the residual cake for cattle food. According to the London "Times" of 19th July, 1910, the requirements of the following season in England were estimated at over one million tons. At the minimum price of £6 10s. per ton this means a business of £6,500,000, but it is doubtful if the beans can be bought under about £8 per ton, owing to shortage of supply. That an industry of such vast proportions should spring up in a few years indicates that all the opportunities of commerce are not closed to those who have foresight enough to search for new openings for trade.

Food for Human Consumption.—The beans form an important article of diet for the Chinese and Japanese, being used in some form or other at almost every meal, and by all classes of people. They are highly nutritious, containing a large amount of edible oil (15 to 20 per cent. of the seed); they are also very rich in proteids and bone-forming mineral matter—phosphates, potash and lime are present in large amounts. The most abundant salt in the ash is sodium phosphate. The protein is present in amounts varying from 30 to 42 per cent. of the bean, and is remarkable in that it consists mainly of albumenoids that resemble milk casein in composition and digestibility; in this respect it differs from any other known bean.

Soy bean milk and sauce preparations, and also the oil, are very nutritious articles of diet.

STORING BEANS IN OSIER BINS, DARIEN.

PILES OF BEANS AT DARIEN WHARVES.

BEANS AND BEAN CAKE AWAITING SHIPMENT.

A medical point of view is given in the *Lancet* of 21st January last :—

> On account of the great nutritive value of the Soy Bean, it is well worth medical attention, more particularly for diabetic cases, because of its low proportion of starch. For making biscuits, soup powder, infant and other foods, it will be widely used in future when its dietetic value becomes better known.

Stock Food (Beans and Cake).—"In England, the bean cake is of even more importance than the oil, representing as it does about 80 per cent. of the raw material. The analysis compares very favourably with the best cotton seed cake meal. In 1909, the bean cake was sold at £6 12s. 6d. per ton in London, while cotton seed cake costs £7 10s. to £7 12s. 6d."—(*Economist.*)

Denmark in 1910 sent large orders to Manchuria as the result of the success attained by feeding the soy cake to cows. With regard to its effect on butter, experiments made at the Cirencester Royal Agricultural College, England, show that no particular flavour was detected as a result of feeding soy cake; and that, compared with cotton cake, the yield of butter was slightly more, and no difference was perceived in laxative effects. On feeding the beans themselves to cows, the butter produced was a trifle soft, but not enough to injure its commercial value, the softness being due probably to the large amount of oil contained in the bean.

From 3 to 4 lbs. of soy beans per day added to the usual dairy ration of hay fodder maize is stated to increase the winter milk yield of the average Kansas cow over 25 per cent. In a series of experiments with pigs in Kansas.—"It was shown that when soy beans are fed with maize, grain, and Kaffir corn for fattening pigs, a saving was made in the amount of feed needed to make 100 lbs. of gain of 13, 24, 31, 33, and 37 per cent., the amount varying in different experiments."

Green Fodder.—Upwards of 13½ tons of green fodder were obtained per acre at Cheltenham, and 10 tons per acre at Ballarat. These are the only two instances in Victoria where records of tonnage per acre were kept. Cows will readily eat this plant, after they become accustomed to the taste.

For green feed, cut when near the full bloom, as at this period the amount of nutrients is much higher than when cut at other stages of growth. When wanted for hay, cut when the pods are about half filled and dry; handle the same as pea hay.

No instance of its use in this State as silage is noted, but in the United States it is often ensiled with green maize, making an excellent succulent food, and being an almost balanced ration.

Rotation Crop.—In the United States it has been found that the yield of crops of all kinds is increased where they follow soy beans, wheat in large fields showing an increase of 5 bushels per acre, over that grown on land alongside that had not been under beans. Wheat generally follows a nitrogenous crop in the usual rotation schemes on the continent.

Fertilizer.—The conclusions arrived at after hundreds of experiments in other countries is that, if there are no tubercles on the roots, the growing bean does not add fertility to the soil, but simply makes available for other crops the plant food already in the soil. When the plants are inoculated with tubercles, undoubted increase of fertility will result in the form of available nitrogen to the soil.

The large quantities of Soy bean cake exported to Japan for use as a fertilizer, (600,000 tons in 1909), without any mention being made of

Japan's own quota, speaks for itself, and this in spite of competition with artificial manures. The Japanese recognize the value of organic manures.

Australians do not attach enough importance to the value of humus as an element of fertility. There is a marked deficiency of this substance over practically the whole of our continent, and this is due to the character of the vegetation. Our trees are evergreen, and consequently do not shed their leaves. In most other countries the deciduous trees predominate, and a large amount of organic matter in the shape of fallen leaves is added to the soil year by year. This becomes decomposed into what is called humus, principally by bacterial action, and this substance becomes one of the great sources of nitrogen for the food of plants. A soil well supplied with humus is generally regarded as fertile. Another great value of organic matter and its resulting humus is its capacity for holding moisture and keeping the soil open in texture. This is why farmyard manure is so appreciated in this country. Soy bean cake, if it can be bought cheaply enough, would be a splendid organic manure for our lands, especially as it also contains a very high percentage of nitrogen, phosphate, and potash.

Green Manure.—The remarks under the previous heading apply also to the use of the plant as a green manure.

ANALYSIS OF GREEN SOY BEAN PLANTS.

Constituents.	Varieties grown at Cheltenham Experimental Farm. (*Cut when Seeds were forming in the Pods.*)								*Heidelberg.* (Matured Plant, Pods Removed).	
	Ito San.		*Guelph.*		*Baird.*		*Brownie.*		Variety not known.	
	Sample as Received.	Dry.	Sample as Received.	Dry.	Sample as Received.	Dry.	Sample as Received.	Dry.	Sample as Received.	Dry.
Moisture	59·70	..	61·20	..	60·10	..	60·80	..	58·0	..
Ash	4·02	9·98	3·96	10·21	4·34	10·85	4·36	11·12	6·43	15·30
Protein (N × 6·25) ..	7·90	19·60	7·54	19·43	6·74	16·85	6·62	16·89	8·20	19·53
Crude Fibre (pentosan free)	5·89	14·62	7·59	19·56	7·55	18·88	5·93	15·13	5·22	12·43
Nitrogen Free Extract	21·26	52·75	18·35	47·29	20·11	50·27	21·19	54·05	21·27	50·65
Ether Extract ..	1·23	3·05	1·36	3·51	1·26	3·15	1·10	2·81	0·88	2·09
Digestible Nutrients.										
Digestible Dry Matter ..	24·08	Albumenoid Ratio, 1 : 3·59.	24·66	Albumenoid Ratio, 1 : 3·52.	24·80	Albumenoid Ratio, 1 : 4·19.	24·30	Albumenoid Ratio, 1 : 4·24.	26·04	Albumenoid Ratio, 1 : 3·33.
„ Protein ..	5·45		5·20		4·65		4·57		5·66	
„ Fibre ..	2·41		3·11		3·10		2·43		2·14	
„ Nitrogen Free Extract ..	15·52		13·40		14·68		15·47		15·53	
„ Ether Extract	0·66		0·73		0·68		0·59		0·48	
	Sample, 2 ft. 9 in. in height.		Main Shoot, 5 feet long.		Main Shoot, 4 feet long.		Sample, 3 feet long.		Sample, 2 feet long.	

VARIETIES.

There are nearly 300 varieties catalogued in Bulletin No. 197—"*The Soy Bean: History, Varieties and Field Studies*, 1910." published by the United States Department of Agriculture. The periods of maturity vary from 80 to over 150 days.

Very early	... 80 to 90 days.
Early	... 90 to 100 ,,
Medium early	... 100 to 110 ,,
Medium	... 110 to 120 ,,
Medium late	... 120 to 130 ,,
Late	... 130 to 150 ,,
Very late	... more than 150

The best varieties mentioned in the Bulletin referred to are:—

Very early.—Ogemaw No. 17258.

Early.—Early Brown 25161, Vireo 22874, Wisconsin Black 25468.

Medium early.—Chernie 18227, Auburn 21079, Elton 20406.

Medium.—Ito San 17268, Medium Yellow 17269, Swan 22379, Brindle 20407.

Medium late.—Brooks 16789, Austin 17263, Peking 17852B, Flava 16789A, Cloud 16790, Haberlandt 17271.

Late.—Mammoth 17280, Hollybrook 17278, Tokyo 17264, Farnham 22312, Flat King 17252, Acme 14954.

Very late.—Barchet 20798, Riceland 20797.

CULTIVATION.

In a general way, any soil that will grow maize will grow soy beans, providing that the soil is not acid in reaction; a soil of medium texture containing lime, potash, phosphoric acid in fair amounts is the most suitable. Good results were obtained on the sandy soil of Cheltenham and on the rather stiff clay hill soil at Lilydale, the potash of the clay being first made available by winter dressing with lime before sowing. If potash and phosphate are lacking, they should be supplied in the form of artificial manure. Nitrogenous manures are not necessary, except in the case of poor or sandy soils to give the young plants a start. The plant is said to be drought resistant, and to be able to endure slight frosts.

Experiences in this State show that if too much rain falls after sowing the seed, and before the plant has had time to thoroughly establish itself, the results are disastrous. The young plants seem to withstand dry weather better than young French beans of the same stage of growth, and their capabilities of withstanding our hot north winds are about the same. No advantage was gained by soaking the seed before sowing, the germination taking from 10 to 25 days. On stiff soil, I found that the imported seed, giving only 10 per cent. germination by the ordinary sowing, 1 in. deep, gave a 90 per cent. germination when shallow 1-in. drills were opened up and the seeds covered with decomposed organic matter (grass), using no soil whatever to cover them.

Do not sow until the ground becomes warm and all danger of frost is over. No extra growth is got by too early sowing; the weeds will be harder to keep down, and more cultivation will be necessary. Better results are obtained from drilling than broadcasting. The seeds should be sown thickly enough in the row to give a plant every 4 in. to 6 in., the rows to be 30 in. to 42 in. apart. About ½ bushel of seed per acre will be sufficient. In preparing the ground, the soil should be well tilled. After sowing, the land must be kept fairly free from weeds, and the surface soil occasionally stirred, but this should not be done when the young plants are wet from dew or rain. The cultivation should be frequent enough to keep the surface soil loose until the beans begin to bloom.

Inoculation of the Seed.—On new land, it is advisable, if possible, to inoculate the seed with soil from an old soy bean field. Plants that become inoculated with tubercles give a much better crop of beans than those that are not inoculated. In the United States a number of different methods for inoculation were tried, and the only satisfactory one was found to be placing the infected soil in direct contact with the beans. If the infected soil is sown broadcast or ploughed in, the results obtained are never satisfactory; 200 lbs. or 300 lbs. of infected soil will be sufficient for one acre and it is probable that a field once inoculated will always remain inoculated.

SOY BEAN PLANT.

HARVESTING SEED.

The flowers are either purple or white according to variety and are completely self fertile; bagged plants set pods perfectly as those in the open. The abundant pollen of each flower covers the stigma almost as soon as the flower opens. In nearly all varieties, the leaves turn yellow as the pods ripen, and most have fallen by the time the pods are mature. On this account, it is difficult to cut the crop for grain and save the foliage as well. A very few varieties retain their leaves, an example being the "Wisconsin Black." The pods are in clusters up to five or more, and a single plant may bear 400 pods, but the most I have seen is 52.

There is a continuous succession of varieties from early to very late. With very few exceptions earliness is correlated with size, the largest varieties being latest. As with the cow pea, early sowing takes a longer time to mature than late sowing. In general, the later the variety, the more is its life period shortened by later sowing. As a general rule, the soy bean, when wanted for seed, should be cut when the majority of the pods are getting brown in colour and about half the leaves have fallen. Some varieties shed their seed very easily when about ripe, and it is advisable

to cut and rake at a time of day when the pods are slightly moist with dew. Rake immediately into small stooks.

In America, portable frames are used and the cut plants heaped in them, thus insuring a good circulation of air to produce good curing. If the crop is cut and bound, the sheaves are apt to become mouldy. When dry, the seed can be readily separated by means of an ordinary threshing machine.

Soy beans for seed must be kept in thin layers in cool, well ventilated bins. When buying seed, empty the bags as soon as received, and keep the beans spread out in a cool dry place. The best of seed, if kept in bags till sowing time, may heat sufficiently to destroy its growing powers.

EXPERIMENTS IN VICTORIA.

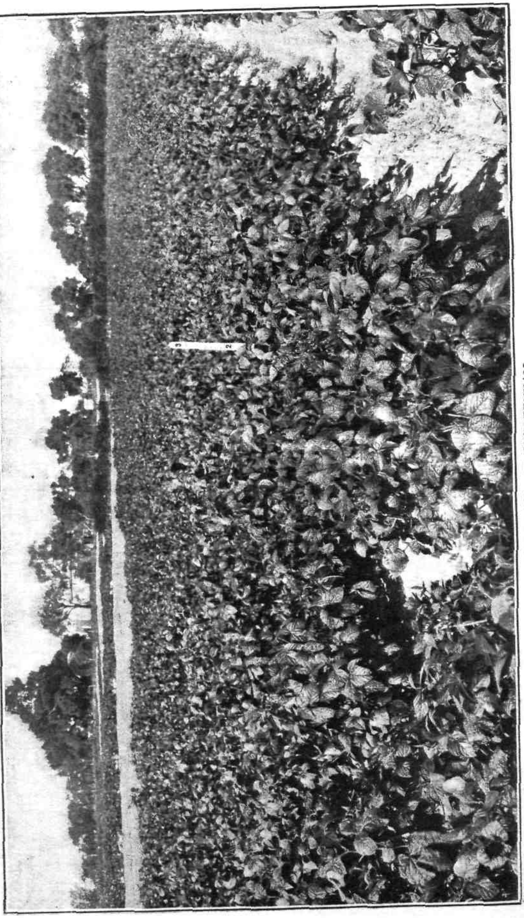
In 1909 a quantity of seed was imported from America. The variety was not known. In some districts, plants from this seed grew very well, notably at Lilydale on clay soil, making a uniform growth of 48 in. and having a strong upright stem. It was evidently a good variety for hay, but bore only a medium crop of beans. The ripe pods did not burst easily, and stood exposure in the field. At Heidelberg, this variety had only medium success. The germination was low, owing to heavy rain rotting the seed which was soaked before sowing. The unsoaked seed also suffered from the prolonged rains and the plants never properly recovered. The seed was sown on 4th October and required twenty days to appear above ground. The pods ripened unevenly and were not ready to harvest until 1st May, the resulting seed being much smaller than the original. No tubercles were found on the roots. At Caulfield, in sandy soil, the seed germinated well, but the plants were eventually ploughed in as green manure.

In September 1910, a consignment was received by the Department of Agriculture from Shanghai, through Mr. J. M. Sinclair, Commercial Agent for Victoria in the East. From this consignment of one variety a number of seeds differing from the bulk in shape or colour were handpicked. These were grown separately at Cheltenham. They were sown on 10th October, and were cut for green fodder on 27th February. The following yields were obtained:—

Variety.	Yield per acre.		
	tons	cwts.	lbs.
Ito San (yellow)	12	8	54
Baird (brown)	13	10	10
Brownie (brown)	11	6	98
Guelph (green)	11	6	98

By the accompanying illustrations it will be seen that some varieties grow luxuriantly at Cheltenham. The soil is very sandy with a clay subsoil. The seeds were sown in drills 3½ ft. apart on the 10th October, and 98 per cent. of the seeds of the varieties mentioned germinated in ten days. The land was kept clean for the first two months by inter-tillage. When photographed, the plants were from 3 to 5 ft. in height, with abundance of pods and leaves.

Experiments were also conducted at Ballarat, Bellarine, Heidelberg, Lilydale and other centres throughout the State. Although a moderate amount of success was achieved further experiments will be necessary. With that object in view the Department of Agriculture has recently imported a large quantity of seed for distribution.



SOY BEANS AT CHELTENHAM.

PROBABLE CAUSES OF FAILURE.

Every new plant has its peculiarities, its likes and dislikes, as to soil, depth of sowing, and susceptibility to climatic conditions; these may vary for each particular variety of soy bean. Until we can find out what varieties are best suited to these varying conditions we must not condemn this bean. Other countries, for instance, the United States, underwent similar experiences, and for a long time the soy bean was much decried. Some of the likely causes of failures in Victoria will now be dealt with.

(1) *Bad Germination.*—It has been proved that seeds rich in both oil and proteids are very susceptible of having their germinative powers destroyed by sweating and heating. As the seeds had naturally to be imported, the result was often a very poor stand or none at all. I have proved this for the last three years, the acclimatized and fresh seeds in every case giving a germination of 95 to 100 per cent. Seed more than one year old, and imported seed that has sweated in transit, are primarily the cause of bad germination. Until there is a sufficiency of locally grown seed to distribute to the farmers, discouraging reports as to germination results will continue to be received.

(2) *Variety.*—So far, there has been no choice of variety. Some varieties are totally unsuited for this State, although succeeding elsewhere, notably the Buckshot and Mammoth. The former was found to be the hardiest for North Queensland and with opposite results in this State.

(3) *Alkalinity of the Soil.*—It must be borne in mind that many of the leguminous plants depend for their successful growth on the presence of the right kind of bacteria in the soil, and on new soil there is often considerable difficulty in getting the soy plant inoculated with tubercles of nitrifying bacteria. By growing this bean for three or four years in succession on the same soil inoculation is almost sure to result, provided the soil is not acid in reaction. My opinion is, that the nitrifying bacteria necessary for the good growth of any papillionaceous plants are all essentially of the same race, with this qualification, that they will take more or less time to adapt themselves to the new kind of legume.

If inoculated soil from an old soy bean field is not sown with the beans on new land, and the proper bacteria are not present already in the soil, it is necessary to have a fair amount of available nitrogen present to grow the plant. Numerous experiments in other countries show that on soils poor in nitrogen, the soy beans, without nodules on their roots, make unsatisfactory growth. It is also recognized that any of the leguminous plants will not thrive on an acid soil, mainly because the bacteria are not in that case able to develop and thrive; therefore, the importance of the addition of lime to those lands to make them alkaline, and also of the secondary effect that the lime has of liberating potash from clays, which is so necessary for the growth of legumes.

(4) *Depth of Sowing the Seed.*—This is another prolific cause of failure. For our climate, the depth of sowing should be as shallow as the moisture supply will permit. There is less chance of failure through the formation of a soil crust. Near Melbourne, I have found that on stiff soils it is sufficient to just cover the seed; 1 to 2 in. would be about the right depth for the warmer parts of Victoria.

Other Causes of Failure may be due to continued heavy rain falling and rotting the seed, or injuring the young tender plants before they are sufficiently developed. Hot north winds are also dangerous. Rabbits, slugs and cut worms are very partial to the young plants.

POTATO EXPERIMENTAL FIELDS, 1910-11.

C. Seymour, Potato Expert.

During the season 1910-11, the experiments in connexion with potato culture were carried out at Broadford, Cavendish, Cheltenham, Colac, Daylesford, Dean, Leongatha, Romsey and Tourello.

The operations at Cheltenham were designed to further test the value of sprouted seed for early market, and also to test the effect of various dressings of artificial manure in combination with stable manure. In both respects the results were the most satisfactory of the three years' series, proving beyond doubt that the yield can be largely increased by this method of treating the seed; and, what is of equal importance, a much cleaner and more marketable sample is obtained. The returns of this field will be found in the *Journal* for March last.

The fields at Broadford, Cavendish, Colac, Leongatha and Tourello were variety tests, combined with artificial manure experiments. Table I. shows the design of the plot and the manurial dressings at Broadford, Colac, Leongatha and Tourello. It was intended that Cavendish plot should be on the same plan; but, owing to a letter of instructions miscarrying, it was slightly altered. The results of this plot are very instructive, both with regard to varieties and to manures.

I.—Manurial Dressings at Broadford, Colac, Leongatha, and Tourello

Section ..	A.	B.	C.	D.	E.
Manure per acre	2 cwt. superphosphate	4 cwt. superphosphate	*No manure*	2 cwt. superphosphate; 1 cwt. sulphate of ammonia	2 cwt. superphosphate; 1 cwt. sulphate of potash
Cost of Manures per Acre	8s. 9d.	17s. 6d.	..	23s. 9d.	22s. 7½d.

Broadford Plot.

This plot was planted on the 24th and 25th November, with thirteen varieties of potatoes, including early and main crop. On reference to Table II. it will be seen that nine varieties were so badly affected with Blight that no returns were obtained from them.

II.—Broadford Plot.

Variety.	A.			B.			C.			D.			E.		
	Tons	cwt.	qrs.	Tons	cwt.	qrs.	Tons	cwt.	qrs.	Tons	cwt.	qrs.	Tons	cwt.	qrs.
White Prolific		Nil		3	6	0	4	13	1	3	3	3	5	0	0
Scotch Grey						Not	harvested.								
Bismarck						Not	harvested.								
Delaware						Not	harvested.								
Carman No. 1						Not	harvested.								
Sutton's Abundance ..						Not	harvested.								
Copperskin						Not	harvested.								
Tasmanian Red ..						Not	harvested.								
Up-to-Date						Not	harvested.								
Snowflake	2	3	1	2	7	3	3	12	3	5	7	0	2	19	0
Black Prince						*Not*	*harvested.*								
Brown's River	2	16	3	3	12	3	4	15	2	4	6	2	3	8	1
New Zealand Pinkeye ..	0	13	2	2	6	3	1	0	0	3	7	2	3	17	1

The varieties marked "nil" and "not harvested" were so badly affected with Blight that no records could be obtained.

During the growing period this plot was most promising in appearance, showing the effect of the manures in a marked manner, but the results are the most unsatisfactory and disappointing of the whole series. It will be noted that the varieties harvested showed a very high percentage of diseased tubers, ranging up to 64 per cent. Under such conditions, no value can be attached to the action of the manure on the yield of the different sections.

COLAC PLOT.

This plot was planted on Messrs. J. and D. Rankin's farm, "The Hill," on the 8th and 9th November. The soil was a rich volcanic. A crop of barley had been harvested the previous year, and consequently the land was in very good tilth. The varieties comprised New Zealand Pinkeye, Sutton's Abundance, Adirondak, Brown's River, Orr's Wonder, Green Mountain, Up-to-Date and six seedling varieties raised by Mr. Ryan of Millbrook.

III.—COLAC PLOT.

Variety.	Sections.														
	A.			B.			C.			D.			E.		
	Tons	cwt.	qrs.	Tons	cwt.	qrs.	Tons	cwt.	qrs.	Tons	cwt.	qrs.	Tons	cwt.	qrs.
Black Prince						Not	harvested.								
New Zealand Pinkeye ..	6	14	3	6	12	2	7	0	0	8	4	3	6	12	1
Ryan's Seedling (27) ..	3	19	2	4	11	2	4	1	3	6	5	1	4	9	1
" " (24) ..						Not	harvested.								
" " (16) ..	4	13	3	5	7	0	4	9	0	6	16	0	4	10	1
" " (11) ..						Not	harvested.								
" " (9) ..	4	18	2	6	0	1	3	8	3	6	19	3	6	7	3
" " (3) ..						Not	harvested.								
Sutton's Abundance ..	3	10	1	5	7	0	5	1	0	5	13	0	5	13	0
Adirondak	2	2	0	2	3	1	1	18	2	3	13	2	2	3	1
Brown's River						Not	harvested.								
Orr's Wonder						Not	harvested.								
Green Mountain ..	3	15	3	3	13	2	2	18	3	4	3	0	3	12	0
Up-to-Date	7	4	2	7	8	1	7	16	2	7	1	1	7	8	1
Average	4	12	1	5	2	3	4	11	3	6	2	0	5	2	0

Improvement of type of New Zealand Pinkeye.—This work was again carried out on the Colac plot. The following table shows the result :—

IV.—IMPROVEMENT OF TYPE OF NEW ZEALAND PINKEYE.

Type Planted.	Full Crowns.	Deep Crowns.
	per cent.	per cent.
Full Crowns	36·7	63·3
Deep Crowns	34·4	65·6

From the above, it will be seen that there is a very slight difference in the percentage in favour of full crowns over the deep crowns. Further, it will be noted that the percentage of the undesirable class is much larger than any previous occasion, and confirms the opinion that this is largely due to weather conditions.

Treatment for Scab.—To test the effect of dipping seed potatoes for scab, a parcel of very scabby New Zealand Pinkeye seed was dipped in a bath of bluestone solution (1 lb. bluestone to 10 gallons of water) for half an hour. Owing to the attack of Blight it was difficult to obtain accurate results, but from Table V. they appear to be slightly in favour of the treated seed.

V.—TREATMENT FOR SCAB.

Variety.	Condition of Seed.	Clean.	Scabby.
		per cent.	per cent.
New Zealand Pinkeye	Treated ..	79·5	20·5
" "	Untreated ..	60·3	39·7

Manures.—This plot was badly attacked by the Blight. On reference to Table III., it will be seen that some varieties were not harvested. The results obtained from the manures are therefore not as reliable as they would have been had the crop been clean. Section A, with 2 cwt. of superphosphate, really shows an increase over the unmanured section (C) of 56 lbs. per acre, whilst the maximum dressing of 4 cwt. of superphosphate increased this yield by 11 cwt. Section D shows an increase of 1 ton 10 cwt. 1 qr. for a dressing of 2 cwt. superphosphate, and 1 cwt. sulphate of ammonia; but this section with a dressing of nitrogenous manure suffered most severely from Blight, nearly half the crop being affected. In section E, the addition of 1 cwt. of sulphate of potash to the 2 cwt. dressing of superphosphate did not increase the yield.

LEONGATHA PLOT.

The plot at Leongatha was planted on the 29th and 30th November, on Mr. G. Williams' farm near the town. The soil was a grey loam on bottom land, very suitable for potato culture in a dry season, but rather wet for such a season as the last. This, no doubt, accounted in a measure for the severity of the Irish Blight, which on this plot supplies some interesting results.

On reference to Table VI., it will be noted that in the unmanured section only one variety survived the attack of Blight, viz., State of Maine. It is also remarkable that this variety returned the highest percentage in this section, as well as the whole plot, of clean tubers, being 83 per cent. clean for section C, and 63.4 for the five sections.

The following varieties were so badly diseased that records could not be obtained, viz., Black Prince, Green Mountain, Brownell's Beauty, Vanguard and Scotch Grey.

VI.—LEONGATHA PLOT

Variety.	Sections														
	A.			B.			C.			D.			E.		
	Tons	cwt.	qrs.	Tons	cwt.	qrs.	Tons	cwt.	qrs.	Tons	cwt.	qrs.	Tons	cwt.	qrs.
Bruce	3	1	1	2	1	0			All	diseased.					
Black Prince						All	diseased.								
Adirondak	3	0	1	3	1	1			All	diseased.					
Scruffle	5	10	1	6	13	0		Diseased		2	5	2	3	9	1
Green Mountain ..						All	diseased.								
Champion	6	0	2	5	18	1		Diseased		3	3	3	4	8	5
Brownell's Beauty ..						All	diseased.								
Vanguard						All	diseased.								
Scotch Grey						All	diseased.								
State of Maine	5	2	1	7	1	0	2	3	1	1	5	0	1	7	3

Manures.—The results from the manurial dressings, as far as their influence on the yield of the crop is concerned, are valueless on account of the Blight. Their influence on the disease in the crop is dealt with at the conclusion of this report.

TOURELLO PLOT.

This plot was planted on Mr. Troup's farm on the 1st November, 1910, and proved the most successful plot of the series. Eleven different varieties of potatoes were planted. Of these four are well known to growers in the district; viz., Brown's River, New Zealand Pinkeye, Scotch Grey, and Copperskin or Orange Pinkeye.

The soil was a good chocolate volcanic, which had received a light dressing of farmyard manure before the first ploughing in the autumn. To this was added the dressing of artificial manures set out in Table I. The condition of the land at the time of planting was very satisfactory. Much of the success of the plot is due to the fact that it was well prepared and received every attention during the growing period.

The plot was practically free from Irish Blight. The New Zealand Pinkeye and Copperskin were both found to be more or less affected by scab which has been common to these varieties for some years past.

Manures.—As already mentioned, the plot received a light dressing of farmyard manure. To this the following chemical manures were added:—Superphosphate, a minimum dressing of 2 cwt. and a maximum of 4 cwt.; superphosphate, 2 cwt., and sulphate of ammonia, 1 cwt.; and superphosphate, 2 cwt., and sulphate of potash, 1 cwt.

VII.—TOURELLO PLOT.

Sections ..	A.			B.			C.			D.			E.			Average.		
Variety.	Tns.	cwt.	qr.	Tns.	cwt.	qr.	Tns.	cwt.	qr.	Tns.	cwt.	qr.	Tns.	cwt.	qr.	Tns.	cwt.	qr.
Clarke's Main Crop ..	9	5	1	10	15	1	11	6	2	11	7	2	11	17	2	10	18	1
Copperskin ..	8	3	2	7	11	3	7	9	2	8	16	1	7	16	1	7	19	1
New Zealand Pinkeye ..	7	5	0	6	5	0	6	5	0	7	16	1	7	11	3	7	0	2
Scotch Grey ..	6	9	1	7	0	2	6	11	2	7	16	1	7	2	3	7	0	0
Brown's River ..	6	2	3	5	19	1	6	9	1	7	19	2	6	8	1	6	11	3
State of Maine ..	5	2	2	5	2	2	4	13	3	4	9	1	5	16	3	5	8	3
Black Prince ..	4	18	0	4	13	3	4	15	3	5	0	1	4	4	3	4	14	2
Fox's Seedling ..	5	4	3	3	19	0	4	10	1	4	7	0	3	12	3	4	6	3
Green Mountain	3	13	2	3	4	2	3	6	3	3	13	2	3	4	2	3	8	2
Carman No. 3 ..	2	9	0	2	2	1	4	11	2	3	15	3	2	9	0	3	1	2
Brownell's Beauty	1	17	3	0	15	2	1	11	1	1	11	1	1	13	1	1	9	1
Averages ..	5	10	1	5	4	1	5	11	3	6	1	0	5	12	2	5	12	2

Number of Misses in Plants per Section of Carman No. 3.

Section ..	A.			B.			C.			D.			E.			Average.		
Carman No. 3 ..	22			17			6			18			20					
	Tns.	cwt.	qr.	Tns.	cwt.	qr.	Tns.	cwt.	qr.	Tns.	cwt.	qr.	Tns.	cwt.	qr.	Tns.	cwt.	qr.
Yield per Acre without misses	5	6	2	3	3	1	5	7	0	6	15	2	4	18	0	5	4	0

Varieties.—As far as the cropping capacity of the varieties is concerned, the heaviest yield was obtained from Clarke's Main Crop, a very vigorous growing, hardy variety, a good cropper and cooker somewhat resembling Up-to-Date in type. This variety is regarded in the Old Country as a good disease resister. In one section it returned 11 tons 17 cwt. per acre, the average of all the sections being 10 tons 18 cwt. 1 qr.

One noticeable feature of the variety test is the very satisfactory yields obtained from three of the standard varieties, viz., Brown's River, 6 tons

11 cwt. 3 qrs.; Copperskin, 7 tons 19 cwt. 1 qr.; and New Zealand Pinkeye, 7 tons 0 cwt. 2 qrs.

Several of the varieties did not do as well as was anticipated. They are:—Green Mountain, Brownell's Beauty, and Carman No. 3.

The object of including Brownell's Beauty in the variety test was to confirm the results of previous experiments in similar soil and climatic conditions, which show that it is not suitable for the later districts of the State. In the case of Carman No. 3, it is necessary to point out that the yield in no way represents the cropping capacity of this variety. The low averages are due to the large number of misses in most of the sections—in A, exactly half the sets failed. Had there been no blanks, it would have averaged 5 tons 4 cwt. per acre. Full details are given in Table VII.

Cavendish Plot.

The soil on this plot was a gravelly loam situated on the slope of a hillside and was not at all suited for potato-growing. In a dry season it is doubtful whether it would yield anything like the quantity obtained last season, which was abnormally wet.

VIII.—Cavendish Plot.

Section ..	A.	B.	C.	D.	E.	Average.
Manure per acre	2 cwt. Superphosphate.	2 cwt. Superphosphate; 1 cwt. Sulphate of Ammonia.	No Manure.	2 cwt. Superphosphate; 1 cwt. Sulphate of Potash.	3 cwt. Superphosphate.	
Cost per Acre..	8s. 9d.	23s. 9d.	—	22s. 7½d.	13s. 1½d.	
	Tons cwt. qrs.	Tons cwt. qrs.		Tons cwt. qrs.	Tons cwt. qrs.	Tons cwt. qrs.
Tasmanian Red	1 0 0	2 10 0	No results	2 10 0	1 10 0	1 17 2
Black Prince ..	1 10 0	3 0 0		3 0 0	2 0 0	2 7 2
Snowflake ..	2 15 0	4 10 0		4 10 0	3 10 0	3 16 1
New Zealand Pinkeye	2 15 0	4 10 0		4 10 0	3 10 0	3 16 1
Average ..	2 0 0	3 12 2	..	3 12 2	2 12 2	2 19 1

The first point in the above table to attract attention is that section C without manure did not produce any crop; there was simply a dwarfed crop of plants which failed to produce any tubers larger than marbles, whilst the manured sections gave what may be considered satisfactory returns.

Manures.—The manures consisted of a minimum dressing per acre of 2 cwt. superphosphate, a maximum of 3 cwt. of superphosphate, and the former combined with 1 cwt. of sulphate of ammonia in section B and with 1 cwt. sulphate of potash in section D.

The results are very striking—no manure, no crop; whilst all the dressings proved highly remunerative. Section A with 2 cwt. of superphosphate costing 8s. 9d. gave a yield of 2 tons per acre; an increase of 50 per cent. of superphosphate in section E only improved the yield by 12 cwt. 2 qrs. This soil would probably respond to heavier dressings of phosphatic manure, up to 5 cwt. per acre; if applied as equal parts of superphosphate and bonedust or basic slag.

The heaviest yields were obtained in sections B and D which cost respectively 23s. 9d. and 22s. 7½d. per acre. Two of the varieties gave

an average for these two sections of 4 tons 10 cwt. per acre. This may be regarded as very satisfactory, and shows the necessity of supplying nitrogen and potash to these soils. It may be interesting to point out that the return for the use of potash is one of the most satisfactory ever obtained in the experimental plots carried out by this Department.

Varieties.—It is satisfactory to be able to state that this plot was absolutely free from Irish Blight. The seed was grown on the Departmental experimental plots at Colac and Leongatha and at the Heytesbury Experimental Farm on the grass-tree plains.

The plot consisted of six varieties. Two of these proved a complete failure, viz., Fox's Seedling and White Prolific, both white-skinned varieties; no returns were obtained from these. Two other varieties, Tasmanian Red and Black Prince proved unsuitable for the district. Both have the habit of producing a large number of tubers; consequently they require a rich soil and favourable weather conditions to develop their crop. Snowflake and New Zealand Pinkeye each gave the very satisfactory average return of 3 tons 16 cwt. 1 qr. per acre. From these returns, it would appear that these varieties are suitable for planting in this district. The New Zealand Pinkeye, for early crop, should be planted as soon as danger of injury from frost is past, and the Snowflake for late planting, as an autumn crop.

DAYLESFORD, DEAN, AND ROMSEY PLOTS.

These plots were devoted to testing artificial manures on chocolate volcanic soil, and were a continuation of the operations carried out at these centres during 1909-10, the previous rotation of crops on each field being practically the same.

The plot at Daylesford, which had been under grass and clover for eight years, was ploughed early and fallowed, and was in an ideal condition when planted. At Dean, the field had been four years under grass and clover, and from which a crop of wheat for hay, and a crop of oats had been taken. The Romsey plot had been under cultivation for upwards of fifty years, without pasture.

The seed was from the farmer's own stock, grown on the farm the previous year. The preparation of the land and treatment of the crop were identical with last season's tests.

The average yields from these plots are as follows:—

Centre.	Yield.
	Tons cwt. qrs.
Daylesford	5 18 0
Dean	6 6 0
Romsey	3 11 0

It should be stated that the crop on the plot at Romsey was affected with the Blight just in the tubering period, otherwise the crop would have shown a higher average yield; but, allowing that the crop was diminished by one-third, it would still have been much below the average of the other two fields on which a proper system of rotation embracing pasture had been followed.

Manures.—From the irregular manner in which the disease attacks the crop it is impossible to form any definite conclusions as to the effect of the

various manurial dressings on the yields of the different sections. The irregularity of the attack of Blight was common to every field; frequently, a patch of a few yards in extent would not have a sound tuber, whilst at no great distance the percentage of sound tubers ranged from 70 per cent. to 80 per cent.

In order to ascertain the influence of pasture in rotation with general cropping, it would be necessary to establish a field or plot to be worked on these lines for a lengthy period.

IX.—MANURIAL TESTS AT DAYLESFORD, DEAN, AND ROMSEY.

Section.	Manures per Acre.				Yields per Acre.								
	Manure.	Weight.	Cost.		Daylesford.			Dean.			Romsey.		
		cwt.	s.	d.	Tons	cwt.	qrs.	Tons	cwt.	qrs.	Tons	cwt.	qrs.
A ..	*Superphosphate* ..	2	8	9	6	1	0	6	4	0	3	2	0
B ..	Sulphate of Ammonia ..	1	15	0	6	13	0	6	2	0	3	8	1
C ..	Sulphate of Potash ..	1	13	7½	5	12	0	5	6	0	3	18	1
D ..	No Manure	..	..		5	15	0	5	4	0	3	8	1
E {	Superphosphate ..	2 }	23	9	6	7	0	6	17	0	3	14	0
	Sulphate of Ammonia ..	1 }											
F {	Superphosphate ..	2 }	22	7½	5	17	0	8	9	0	3	6	2
	Sulphate of Potash ..	1 }											
	Superphosphate ..	2 }											
G {	Sulphate of Ammonia ..	1 }	37	7½	5	1	0	8	1	0	4	0	1
	Sulphate of Potash ..	1 }											
	Averages ..	..	..		5	18	0	6	11	3	3	11	0

PERCENTAGE OF TUBERS AFFECTED WITH IRISH BLIGHT.

An accurate account of the weight of diseased tubers in each variety in the different plots was taken in order to find the comparative resistance to Irish Blight; also to find out whether the manures had any effect in minimizing or increasing the virulence of the disease. From the accompanying tables it will be seen that some varieties were so badly diseased as not to be worth digging. These are stated as resulting in 100 per cent. of disease, because only here and there could a sound tuber be found. As, under such conditions, no grower would attempt to harvest the crop, they may therefore be properly regarded as a failure.

As far as the influence of the manures on the amount of disease is concerned, the results given in the summary of plots show that the section containing a nitrogenous manure had the highest percentage of disease (80.2 per cent.), closely followed by the unmanured section with 79 per cent. There can be no doubt that, where a nitrogenous manure causes a luxuriant growth of foliage, the disease does a greater amount of damage. This was shown in a marked manner in section D of the Colac plot, where it reached 69.4 per cent. In the unmanured section at Leongatha only one variety produced tubers; all the others failed. Sections A and B, dressed with superphosphate, gave the lowest percentage of disease. This has been confirmed by reports from several growers.

Varieties.—It is a common thing to meet with certain varieties which are spoken of as Blight-proof. This arises, in a large measure, from the fact that where several are planted in the same field some will be badly attacked by the disease and one will escape. A case in point, Green Mountain, occurred in the Colac plot. By many, the one that escapes is often called Blight-proof, although in another plot it may be totally destroyed by the disease.

The following are the varieties showing the lowest percentage of disease:—Sussex, a variety raised by Mr. J. P. Ryan of Millbrook, 6.4 per cent.; Adirondak, a variety grown under the name of Excelsior, 9.1 per cent.; Sutton's Abundance, 17.2 per cent.

X.—SUMMARY OF AVERAGES OF DISEASE IN MANURE PLOTS.

Section.	A.	B.	C.	D.	E.	F.	G.	
District.	2 cwt. Superphosphate.	1 cwt. Sulphate of Ammonia.	1 cwt. Sulphate of Potash.	No Manure.	2 cwt. Superphosphate; 1 cwt. Sulphate of Ammonia.	2 cwt. Superphosphate; 1 cwt. Sulphate of Potash.	2 cwt. Superphosphate; 1 cwt. Sulphate of Ammonia; 1 cwt. Sulphate of Potash.	Average.
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Daylesford ..	28	16	12·5	36	36	25	26	25·6
Dean ..	27	23	26	32	26	26	16	25·1
Romsey ..	89	87	93	87	86	84	87	87·4
	49·3	42	43·8	51·6	49·3	45	43	46·2

XI.—SUMMARY OF AVERAGES OF DISEASE IN VARIETY PLOTS.

Section.	A.	B.	C.	D.	E.	
Manures	2 cwt. Superphosphate.	4 cwt. Superphosphate.	No Manure.	2 cwt. Superphosphate; 1 cwt. Sulphate of Ammonia.	2 cwt. Superphosphate; 1 cwt. Sulphate of Potash.	Average.
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Broadford ..	88·8	87·6	87·5	84·7	84·5	86·6
Colac ..	57·9	52·3	58·7	69·4	52·6	58·1
Leongatha ..	71·1	67·2	91·7	86·7	84·9	80·3
	72·6	69·0	79·3	80·2	74·0	75·0

XII.—BROADFORD PLOT—PERCENTAGE OF IRISH BLIGHT.

Variety.	Sections.					Average.
	A.	B.	C.	D.	E.	
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
New Zealand Pinkeye	67	77	81	74	82	76·2
White Prolific	100	72	61	57	52	68·4
Scotch Grey	}					
Bismarck	}					
Delaware	}					
Carman No. 1	} 100	100	100	100	100	100
Sutton's Abundance	}					
Copperskin	}					
Tasmanian Red	}					
Up-to-Date	}					
Snowflake	37	38	25	13	15	25·6
Black Prince	100	100	100	100	100	100
Brown's River	52	53	71	58	50	56·8
	88·8	87·6	87·5	84·7	84·5	86·6

XIII.—COLAC PLOT—PERCENTAGE OF IRISH BLIGHT.

Variety.	Sections.					Average.
	A.	B.	C.	D.	E.	
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Black Prince	38·4	28	40·5	87·6	26·6	44·2
Bedford	36·5	20	58·8	66·3	32	42·7
Norfolk	38·4	28	40·5	87·6	26·6	44·2
Sussex	4·5	3·9	5·8	15·3	2·7	6·4
Wellington	100	100	100	100	100	100
Marlborough	100	100	100	100	100	100
St. Albans	100	100	100	100	100	100
Sutton's Abundance	20	11·2	17·8	21·2	15·9	17·2
Adirondak	5·8	5·5	6	22·9	5·5	9·1
Brown's River	100	100	100	100	100	100
Orr's Wonder	100	100	100	100	100	100
Green Mountain	Nil	Nil	Nil	Nil	Nil	..
Up-to-Date	55	42	58	51	37	48·6
New Zealand Pinkeye	55·3	42·4	35·9	51·3	37·2	44·4
	57·9	52·3	58·7	69·4	52·5	58·1

XIV.—LEONGATHA PLOT.—PERCENTAGE OF IRISH BLIGHT.

Variety.	Sections.					Average.
	A.	B.	C.	D.	E.	
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Bruce	33	17	100	100	100	70
Black Prince	100	100	100	100	100	100
Adirondak	44	17	100	100	100	72·2
Scruffle	38	35	100	57	44	54·8
Green Mountain	100	100	100	100	100	100
Champion	74	56	100	46	72	69·6
Brownell's Beauty	100	100	100	100	100	100
Vanguard	100	100	100	100	100	100
Scotch Grey	100	100	100	100	100	100
State of Maine	22	47	17	64	33	36·6
	71·1	67·2	91·7	86·7	84·9	80·3

Conclusions.—Opinions differ as to the period in the life of the plant when it is liable to attack; also as to the attack of the tubers, and the actual resistance to attack of certain varieties.

From careful observation on these points in the field, it was found to attack the plants from 2 in. high up to the last stages of growth. It was evident that when the spores are being carried through the crop it matters little, if weather conditions are favourable, whether the plants are just over ground, or in the last stages of growth, except that in the latter case the injury to the plant is not so great.

In the case of the disease in the tubers, it is controlled entirely by the weather conditions that prevail after the disease has struck the crop. If rain falls shortly after the crop goes down, the tubers are sure to show a high percentage of disease, unless they have reached a stage when the skins are set.

The resistance of certain varieties does not appear to be as satisfactory as could be wished. An instance is given of a variety in one district showing a total loss, whilst in another district among a badly diseased crop composed of nine or ten varieties, it escaped altogether. Again, Up to Date, a recognized resistant variety, failed in one plot from

disease. The same may be said of Excelsior and Snowflake. An instance may also be mentioned where a crop of Carman planted the third week in November returned 75 per cent. of clean tubers; while an adjoining field, planted with the same seed three weeks later, was not worth digging.

PLOT AT SHEPPARTON AGRICULTURAL HIGH SCHOOL.

The experimental plot at the Shepparton Agricultural High School was planted on 4th February. Although this was rather late in the season, the results may be considered satisfactory. The soil was a sandy loam and even throughout. The plot was commanded by the irrigation channels and well suited for the application of water; but, owing to the abundance of rain and the low evaporation, it was only found necessary to irrigate once during the growing period.

The results from the manurial dressings, which indicate the necessity of phosphoric acid in liberal quantities, will afford a basis for future operations.

Two varieties were used in planting the plot, viz., Early Rose and Carman. The seed of the latter was of such an unsatisfactory character, and the plants so irregular in growth, that in estimating the value of the operations and the influence of the manures on the crop, the results have been dispensed with, only those from the Early Rose variety being considered.

Section C, without any manure, returned 3 tons 6 cwt. 1 qr., whilst on section A1, with a dressing of 1 cwt. of superphosphate, there was a decrease of 6 cwt. 1 qr. indicating that a light dressing is injurious. Section A2, with the maximum dressing of 2 cwt. superphosphate, gave an increase of nearly 1 ton per acre. Section B, with the addition of 1 cwt. of sulphate of ammonia, shows an increase of only 15 cwt. per acre over the plot with no manure. A remarkable feature of the returns from section D is that, with the addition of 1 cwt. of sulphate of potash to the dressing of superphosphate, the yield was 6 cwt. 1 qr. less than the unmanured.

The most satisfactory return was from the complete manure composed of 2 cwt. superphosphate, 1 cwt. sulphate of potash, and 1 cwt. sulphate of ammonia. The results of one year must not be considered conclusive proof that these are the most satisfactory quantities of manure. Further experiments are necessary to confirm the above and also to test a further increase of superphosphate.

XV.—SHEPPARTON AGRICULTURAL HIGH SCHOOL PLOT.

Variety.	Sections.																	
	A1.			A2.			B.			C.			D.			E.		
	Tons	cwt.	qrs.	Tons	cwt.	qrs.	Tons	cwt.	qrs.	Tons	cwt.	qrs.	Tons	cwt.	qrs.	Tons	cwt.	qrs.
Early Rose	*3*	*0*	*0*	*4*	*5*	*3*	*4*	*1*	*1*	*3*	*6*	*1*	*3*	*0*	*0*	*4*	*15*	*1*
Carman ..	2	11	1	2	7	0	2	13	2	1	10	0	1	15	2	1	12	0

The following yields of small lots were also obtained:—

	Tons	cwt.	qrs.
Cook's Favourite..	3	18	3
Adirondak	2	15	1
Delaware	3	5	2
Bismarck	2	5	0
Carman No. 3	*2*	*5*	*3*
Vermont	5	17	0

DRIED FRUITS BEETLE.

(*Carpophilus hemipterus*, Steph.)

C. French, Junr., Acting Government Entomologist.

The Dried Fruits Beetle is a native of Europe; and, like many other European insects, has spread throughout the world. Unfortunately it has got a firm hold in Victoria, and is causing considerable losses to growers and others interested in the dried fruits industry. Though seldom seen out of doors, it has recently been found in several of the large warehouses where dried fruits are stored. During the last few months quite a number of dried figs, apricots, and prunes, damaged by it have been submitted to this Branch.

LIFE HISTORY.

The Dried Fruits Beetle is about ⅛ in. long by 1-16 in. broad, with dark-brown, sometimes black, elytra or wing cases marked with yellowish white markings on the upper and lower parts of the cases, the lower markings being the largest. The wing cases are short, exposing the last two segments of the body.

The insects breed in pantries and other places where dried fruits are kept.

The eggs are deposited on the dried fruits generally in the spring, and hatch in about a week. The larvæ at once commence to feed, ultimately turning into pupæ. In this state, they remain for about one month, when they emerge as perfect insects. During the time they are at work, they eat part of the fruits, causing some of them to turn black. The fruit is also covered with excreta from the insects and thus rendered unfit for human consumption.

EXPLANATION OF PLATE

1. Perfect insect, upper view. Magnified.
2. Perfect insect, under view. Magnified
3. Larva. Magnified.
4. Larva. Head and Segments. Magnified.
5. Larva. End of Abdomen. Magnified.
6. Antenna. Magnified.
7. Foreleg. Magnified.
8. Wing. Magnified.
9. Perfect insect. Natural size.

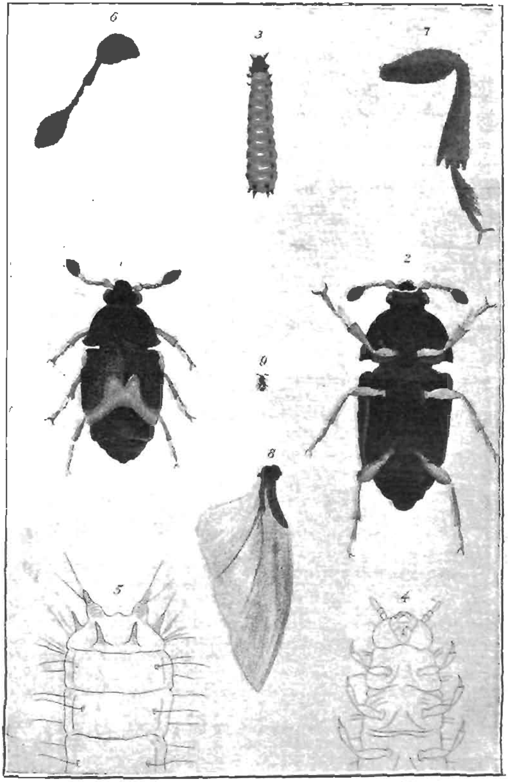
PREVENTION AND REMEDIES.

When dried fruits are attacked by these insects the only measure that can be taken is to separate the good from the damaged fruit, a tedious undertaking. The damaged fruit should then be destroyed.

Cleanliness in stores is one of the most important matters which should receive attention. Prior to receiving a consignment of dried fruits, the store should be thoroughly swept, and then fumigated with hydrocyanic acid gas. The latter will destroy any beetles that may be hiding in the crevices. Great care must be exercised in the use of the gas. It would be advisable, before using it, to communicate with the Entomological Branch and obtain full information as to method to be adopted. Similar treatment for Flour Moths has proved most effectual in the large mills, and is now coming into general use.

When the fruits arrive, the boxes should be wrapped with strong paper or, better still, placed in large airtight tin boxes. This will prevent attack, especially if the fruits are to be stored for a lengthy period. The boxes should be kept off the floor. The beetles are liable to enter a building at any time during the warm weather.

As the Victorian dried fruit industry promises to be very large, great care should be taken by growers and others to see that airtight boxes are used: if not, trouble will surely arise when they are placed in city stores.



C. C. BRITTLEBANK, DEL. C. FRENCH, DIREXIT.

DRIED FRUITS BEETLE.

(*Carpophilus hemipterus*, Steph.)

PROPAGATION OF FRUIT TREES.

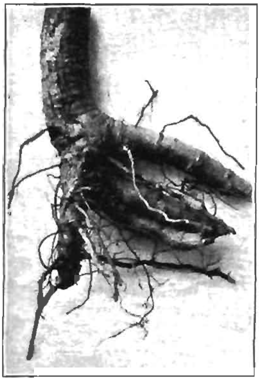
(Continued from page 529.)

C. F. Cole, Orchard Supervisor.

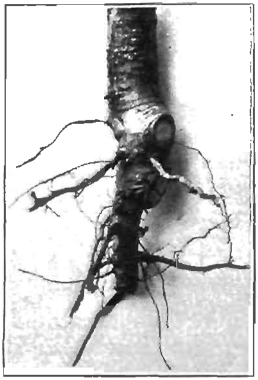
TRIMMING STOCKS FOR PLANTING.

When performing this important operation it is just as easy to make a correct cut as an incorrect one. The chief aim of the operator is directed against the roots, and by careful and intelligent cutting good sound uniform conditions are encouraged.

The future growth of the stock and tree is influenced to a very great extent by the roots. To get an evenly balanced tree, it is necessary to have well-balanced root growths. The stronger the root supply upon the one side, the greater will be the flow of sap and elaboration of nourishment



24. FAULTY ROOT CONDITIONS.



25. CORRECT TREATMENT.

to those parts of the tree influenced by the stronger roots. Fig. 24 shows such a type of stock, the stronger root conditions upon the one side starving those upon the other; consequently, the side of the tree corresponding with these roots is the stronger. To rectify this, and to bring about an evenly balanced root condition, the three large roots should be hardened back as shown in Fig. 25.

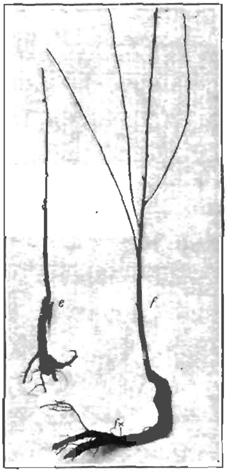
Figs. 26*a* and 26*b* illustrate two common types of apricot seedlings from seed bed. One has a long tap root, whilst the other has typical and uniform root conditions. When trimming apricot stocks, cut the roots fairly hard back and remove any bruised, or broken ones. The lateral growths should be cut cleanly and close into the main stem, only leaving two; these are cut hard back at the terminal end to form the head of the stock, see Fig. 26*b*. The lateral growths should not be snicked off in a

haphazard manner so as to leave short pieces projecting. Such pieces will ultimately die back to the main stem and the bud or buds at their base, if any, will shoot forth. When cut as advised the wounds will heal over, leaving a clean and free stem for inserting the bud in season.

When root pruning a type like Fig. 26*a* harden back above, and not below, the small projecting side root and at the place marked thus:—If cut below, the probable result will be that this root will break away and make a strong growth, thus preventing others from pushing out above and forming an evenly balanced root condition. By cutting above at — an even supply of root growths, similar to that of Fig. 26*b*, will be forced out. Make this cut straight across and not slanting. If possible, cut all lateral growths back to the base buds, making a straight rod of the stock.

26. TYPES OF STOCKS—APRICOT AND PEAR.

a Poorly trimmed. *b*, Properly trimmed. *c*, Properly cut pear stock. *d*, Untrimmed pear stock (cut at lines).



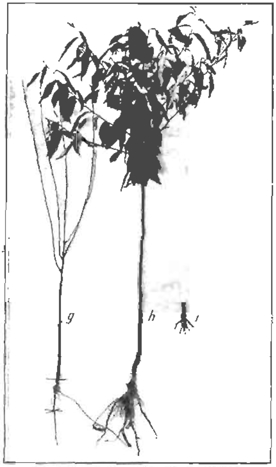
27. TYPES OF CHERRY STOCKS.

e. Proper type, correctly trimmed
f. Useless type.

Fig. 26*d shows a seedling pear stock. The root should be treated the* same as Fig. 26*a*, the top being headed back to the required length. Fig. 26*c* shows a similar pear stock treated ready for planting out.

A difficult stock to root prune at times is the Kentish Cherry sucker. Without the requisite practical knowledge, many stocks will be planted out and will not produce sound root conditions; others will either die out, become stunted, or be found to be useless when the worked tree is lifted for *planting out permanently in the orchard. Fig.* 27*f illustrates a type of* cherry stock that is useless as far as root conditions are concerned. If cut

anywhere above x, the probable result will be death, owing to the cherry not being so free in pushing out roots like many other kinds of stocks. Although such a type of stock generally produces a well grown tree in the nursery bed, it is inadvisable to plant it. It should be discarded as useless. Trees worked upon this type of stock sway about and are very easily blown over during wet and squally weather. At first glance, this class of root is rather misleading and differs from Fig. 24 by having the sap flow evenly distributed to all parts of the stock or tree. This is brought about by the apex end of this bent root having sound rooting conditions.



28. TYPES OF PEACH STOCKS.

g. Sound type. *i.* Cut ready for planting.
h. Result of such treatment.

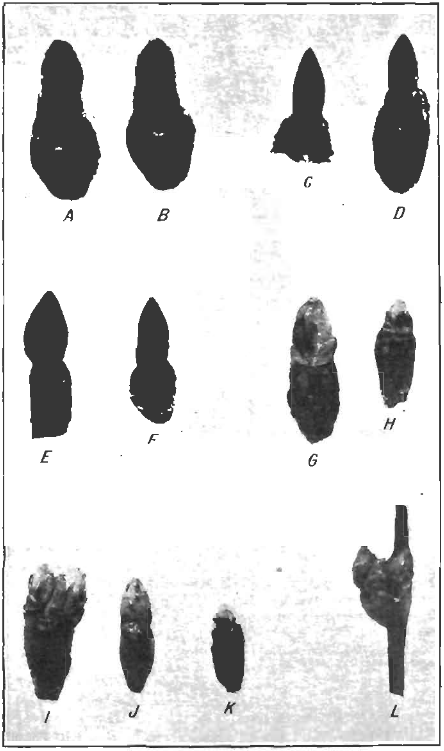
When budding peach stocks, it is always advisable to have good seasonable growth to operate upon. To secure this growth, when trimming lifted stocks from the seed bed, cut hard back to the buds at or near the ground level, or apex end of the stem, see Fig. 28*g*. Stocks treated in this manner should be planted well down, the tops being upon a level with that of the opened out trench or grip. The roots should be cut hard back to encourage vigorous and healthy root growths, see Fig. 28*i*. Fig. 28*h* shows treated stock with six months' growth and ready for budding.

If stocks are not likely to be planted out shortly after being trimmed, it is advisable to delay the operation until a few days before planting. If operated upon and left heeled in any length of time the buds will start to move out much sooner than when left untrimmed. The terminal buds upon the stocks are generally the first to move, owing to the sap flowing to the higher points. August and early September are the months that planting deciduous stocks is in full swing in a nursery, but early planting should be practised were possible, *i.e.*, if the soil conditions are suitable. Stone fruits should receive attention first, then pears, and lastly apples.

BUDDING.

Budding is an art easily learnt and quickly performed. The beginner will do well to make himself thoroughly proficient in the handling of a knife. This may be done by constantly using it, and at every opportunity practising bud cutting, etc. He will not only gain confidence, but allay the fear of cutting himself, and in a very short time will handle a knife with as much ease and dexterity as a ready writer would his pen. Budding is the quickest mode of increasing a variety; every bud properly selected and cut is capable of becoming a tree under favourable conditions.

Budding is chiefly performed in Victoria from the middle of January until the middle of April. As the early budding is controlled principally by the condition of the buds, care should be taken to see that they are



29. TYPES OF BUDS, WOOD AND BLOOM.

(See explanation on page 646).

well matured, otherwise there is a big risk of having to re-bud the stocks a second time. The late budding is controlled by the condition of the sap in the stocks relative to the opening of the bark. January covers early budding and April late.

When selecting buds, choose only those upon well grown, matured and healthy young growths from productive trees. Exercise care in seeing that wood and not bloom buds are selected—there is a greater risk of taking bloom buds from fruiting than young growing ones. With fruit-producing trees, there are exceptions where trees are not so prolific and robust as others of their kind. To select buds or grafts and propagate from such trees is faulty, no matter under what conditions this sterility may have been brought about. The aim of the propagator is to encourage the bearing, and not the non-bearing strain in all varieties of fruits. One type of bloom bud (apple) is illustrated on page 647. Generally speaking, the bloom buds are full, whilst round the wood buds is firm and pointed. No hard-and-fast description can be laid down, both bloom and wood buds varying according to the variety. With the Cleopatra, Jonathan, Rome Beauty, and other varieties of apples, also with many pears, the bloom buds upon the young growths differ greatly from those upon the fruiting spurs. They are long and flat upon the underside and round upon the upper, the wood buds being small, dumpy and slightly pointed.

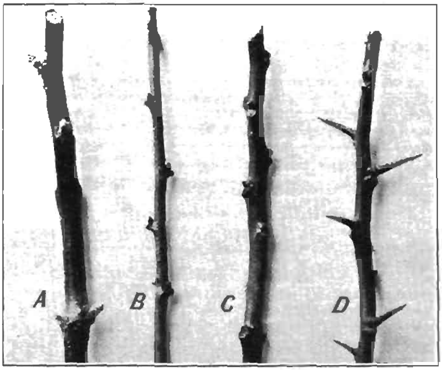
Illustration No. 29 shows a few types of bloom and wood buds; *a* and *b* are buds of the Crow's Duke cherry. The bloom bud (*a*) shows a slight difference from the wood bud (*b*) by being full and round—the wood bud is slightly pointed; *c* and *d* are buds of the Twyford Bigarreau cherry. The reader will notice the resemblance between them; also that the bloom bud *c* is stouter at the base than that of the wood bud *d* and is of a uniform colour, whilst the wood bud has grey markings; *e* and *f* are buds of the Morello or Plum Stone cherry. They are somewhat similar in shape to *c* and *d*; but, instead of the bloom bud *e* being stout at the base, it is narrower and very full and round towards the middle; *g* and *h* show types of apple buds upon young growths. This bloom bud (*g*) is easily distinguished from the wood bud *h*; *i* is a triple peach bud with a bloom bud on each side of the wood bud; *j* is a single bloom bud (peach); *k* a single wood bud (peach); and *l* a triple apricot bud, the node being large and the wood spindly. The reader will recognize from these few examples that, when selecting buds, it is easy to err on the wrong side, especially if one's knowledge of buds is limited.

Buds should not be used at the apex or near the terminal end of the growths. With many varieties, the apex buds are imperfect or blind, the terminal ones being weakly. With plum buds, the writer's experience is that apex buds, from some cause, are liable to drop after the stocks have been cut off close to the bud and when the sap is starting to flow. This is especially so with varieties like Coe's Golden Drop and Diamond. With the apricot, almond, peach and nectarine, we find triple buds. Such buds are strong and may be used with safety. Avoid, if possible, apricot buds upon spindly growth having the node large, *i.e.*, the part of the base of the leaf stem and bud.

Select buds from clean healthy growths, vertical if possible. The propagator will require to be exceptionally cautious when selecting cherry buds, especially those from fruiting trees and varieties having the wood and bloom buds similar in shape. If, by mischance, a bloom bud is inserted into the stock and union takes place, such a bud will bloom in the spring and then become blind. In this respect, the cherry differs from many other kinds of fruits; i.e., when a bloom bud is inserted and, while flowering, the blossom is cut or pinched off, it will usually push forth a shoot. The base of the young growth is not so straight as that direct from a wood bud; seldom does the cherry shoot from a bloom bud or that part where a bud has been knocked out.

When selecting buds from citrus trees (lemons, oranges, etc.), choose those upon well rounded matured growth having no large thorns. Very small ones will not matter. See illustration 30*c*. Avoid ridged growths having large thorns—illustration 30*d*. With the loquat, select buds from well matured, and not from soft, sappy, growths. The same applies to the mulberry.

Having removed from the tree the growths to be used for cutting buds, cut off the leaves close to the buds, leaving about ¼ in. of the leaf stem for inserting the buds (30*b*). Do not allow the cuttings to wilt. Stand them in a tin or other suitable vessel containing enough water to slightly cover the apex ends only, until required during the day. Although cuttings from some kinds of trees will keep standing in water for several days with-



30. TYPES OF BUDS.

a. Bloom bud (apple). *b*. Properly prepared wood buds. *c*. Sound type of citrus bud. *d*. Wrong type.

out hurt, it is far better, where possible, to cut freshly each day the quantity required. Failing this, a good plan is to keep them buried in moist sand or soil. Cuttings so treated should be rinsed in water when removed. Citrus cuttings should not be allowed to stand in water over 24 hours. If cuttings are wilted, slightly cut off a small piece at the apex end and stand in water for a few hours. This treatment will freshen them up again.

The time for budding the different kinds of fruits will be controlled, to a very great extent, by the condition of the stocks to be worked. Budding cannot be performed unless the bark separates freely from the wood, or, in other words, runs easily. Old stocks will require to be budded earlier than young strong growing ones. Taking all things to be favourable, the following will be a guide covering all districts of the State, late and early, as to the time for budding different kinds of fruits:—

Citrus family.—December, January, and February.
Mulberries.—January and February.
Apples.—February to April.
Apricots.—February to the middle of April.
Almonds.—February to April.

Cherries.—February and March.

Loquats (on Quince stocks).—Middle of February to the middle of April.

Medlars (on Quince stocks).—February to the middle of April.

Nectarines and Peaches.—Middle of February to the middle of April.

Pears.—Middle of January to the middle of March. (On Quince stocks).—February to the middle of April.

Plums.—February to the middle of April.

Quinces.—February to the middle of April.

Walnuts.—January, February, March. With early budding, this will vary somewhat, according to the seasons and the ripening of the buds.

(To be continued).

ORCHARD AND GARDEN NOTES.

E. E. Pescott, Principal, Horticultural School, Burnley.

The Orchard.

There are indications that the present season will be an early one; for, at the time of writing (10th August) early flowering peaches, plums, and pears were opening their blossom. That the season has been an abnormal one is shown by the fact that, at the same time, some apple and apricot trees are still carrying their last season's foliage. There is ample evidence, from the abundance of the buds, that the coming season will be a productive one.

The advent of September always brings abundant work in the orchard; ploughing, manuring, grafting, spraying for black spot, peach aphis, and leaf curl, and planting of citrus trees, all need attention.

SPRING PLOUGHING.

The orchard should receive its spring ploughing at once; and it is important that this should not be delayed. Early ploughing is always much more easily done, and it is no trouble afterwards to work up a good loose surface. The longer the ploughing and cultivation are delayed, the harder the work becomes, and the greater the loss of water from the soil. A level, well tilled, and loose surface, free from clods, and free from irregularities is what is needed in summer.

Where leguminous cover crops are in full flower, these should be ploughed in at once. If the crop be a heavy one, it may be rolled or mowed, before it is ploughed in.

SPRAYING.

Peach aphis will be making its appearance, if it has not already done so. As soon as it appears, frequent sprayings with a nicotine solution will be required to keep it in check. It is advisable to spray early, and to spray a second time a few hours after the first spraying has been completed. After the first spraying, the aphides that remain alive generally endeavour to find a more congenial position. These moving ones, as well as the weakened ones, are then readily dealt with by the second application. Red oil emulsion should not be used, as this is only a winter spray.

As soon as the flower buds of the apple and pear are opening, these trees should be sprayed with Bordeaux mixture for black spot. Peach and nectarine trees will need a Bordeaux spraying for leaf curl; and plum trees also, for plum or prune rust.

There are a number of Bordeaux pastes on the market, and there is no doubt that the use of these ready made sprays will become very popular,

owing to the ease with which the spray may be mixed. But caution will need to be observed in the use of these pastes, as some have proved far from satisfactory; only those which have been tried and proved perfectly satisfactory should be used. Again, they should be perfectly fresh; it will be unwise to use stale pastes of any kind. The results would certainly be unsatisfactory; while, in some instances, the leaf and flower buds would suffer thereby.

In spraying peach trees for peach aphis and leaf curl, or for aphis and prune rust, the tobacco solution and Bordeaux mixture may safely be used as a mixture without any fear of damage to the trees.

In some cases, the copper-soda spray is preferred by orchardists, in lieu of Bordeaux mixture. It is certainly good in many instances, and where fresh lime is not procurable, or where the climate is dry, the copper-soda mixture is useful as a fungicide. It is, however, not so adhesive as Bordeaux, and is readily washed off by rain or heavy dews. The copper-soda mixture should not be used on stone fruits, particularly peaches, as the foliage of these trees is too delicate for the use of this spray. The recognized formulæ are:—

Bordeaux: 6 lbs. bluestone, 4 lbs. fresh lime, and 50 gallons of water.

Copper-soda: 6 lbs. bluestone, 8 lbs. washing soda, and 50 gallons of water.

Vegetable Garden.

Frequent cultivation will be necessary this month, especially after waterings. Owing to the excessive and frequent rains, many seedlings that came up earlier completely damped off; hence fresh sowings will be necessary. All seedlings, such as tomatoes, onions, cabbage, cauliflower, lettuce, &c., that have succeeded in growing may be planted out in the beds.

Wherever such pests as tomoto weevil, cabbage moth, cabbage aphis, cut worms, &c., were prevalent in the soil last season, it would be advisable, *before planting, to give the beds a dressing of such substances as will tend* to reduce or eradicate them. These preparations include lime, tobacco dust, pestend, and manurial insecticide.

Seeds of the pumpkin and melon family may be sown, as well as seeds of tomatoes for late crops.

Flower Garden.

September is the month of the Daffodil and the Wattle, two flowers of gold.

THE DAFFODIL.

The daffodil is included in the narcissus family, and the many species are in full flower at the present time. These popular flowers of spring are well worthy of a place in every garden. They repay handsomely any care or attention that is given to them; at the same time, they will generally stand a good deal of neglect. To get the best results from daffodils, they should be planted in special beds, where they will not be interfered with by either water or cultivation during the dormant season. Otherwise, if in the beds with other flowers, they should be lifted when the foliage turns yellow, and stored in a dark dry place.

Amateur growers frequently make a mistake in cutting down the foliage shortly after the blooms have faded. This is a serious error; as, so long as the foliage is green, it is required for sap circulation and assimilation. Cutting the foliage undoubtedly weakens the bulbs, and frequently prevents flowering the next season. The untidiness of the foliage can be relieved by either tying the foliage to a stake or by tying up in a knot.

It is becoming increasingly popular to grow daffodils in grass plots, or on slopes. The naturalizing of these flowers in grass is easily accomplished, as it is only necessary to make a hole large enough to drop the bulb in, covering it up again with the small piece of turf previously removed. Daffodils may thus be grown in paddocks where a few head of cattle are allowed to wander. Cattle refuse to eat the plant; and it is surprising how very few they trample down. Daffodils growing in grass are a very pretty sight, and the system is well worthy of a trial.

Wattle Planting.

The newly formed Wattle League is another means whereby attention is drawn to this lovely national flower. The objects of the League are to foster a love for the wattle, and to encourage the planting of the wattle in our parks and gardens. A very large number of wattles are suitable for cultivation. Everybody is familiar with the Cootamundra Wattle (*Acacia Baileyana*) and with the Golden Wattle (*A. pycnantha*); but there are many other beautiful forms quite as easily cultivated as these. These are *Acacia saligna*, a fine weeping species from West Australia; *A. spectabilis*, a beautiful orange coloured weeping variety, with pale ferny foliage, from New South Wales; *A. rubida*, and *A. podylarifolia*, two sweet scented species; *A. juniperina*, a cream coloured, spine foliaged variety; *A. acinacea*, a fine flowered dwarf shrub from Northern Victoria; *A. verniciflua*, also of dwarf habit; *A. leprosa*, *A. retinodes*, *A. suaveolens*, *A. pravissima*, *A. myrtifolia*, *A. cultriformis*, *A. oxycedrus*, *A. elata*, *A. Farnesiana*, and many others, are all suitable and useful for garden work.

It is not generally known that Acacias may be grown as pot plants. They are very suitable for pot culture, especially such varieties as *myrtifolia*, *verniciflua*, *acinacea*, and *juniperina*, which are of a dwarf habit. Acacias are also very amenable to pruning and pinching back, and they may be trained into very shapely and graceful bushes.

Acacia plants may now be transplanted. It is also a good time to sow the seed. The outer covering of acacia seed is very hard and the growing root is not able of its own accord to penetrate it. The seed must therefore be immersed for a few moments in boiling water, and allowed to soak for at least 12 hours. After this, they may be planted direct into the garden or into pots for subsequent transplanting.

Seasonable Work.

Ordinary garden work this month includes frequent and constant cultivation of the beds. The hoe should be kept busily employed to prevent surface caking. The soil will be surcharged with moisture after the heavy rains of this year; and, if this be conserved by regular hoeing, much summer watering will be avoided. The hoeing will also kill all weeds, which is a necessity.

Wherever it appears, the rose aphis will require to be checked by spraying with some nicotine or soapy solution. As soon as any aphides are noticed, they should be sprayed, and when the plants have all been sprayed, they should be gone over again a second time, on the same day if possible, so as to do the work thoroughly.

For rose scale, the lime-sulphur spray may be used to clean the old stems, but the spray should not touch the young growth or buds.

Roses may now be disbudded of their superfluous growths, by removing all crowding and badly placed shoots.

A watch should be kept for mildew, which should be dusted with sulphur as soon as it appears. It is also a good plan to dust some sulphur on the soil, so that the fumes may also act on the fungus.

Chrysanthemums, cannas, and other herbaceous plants may be planted out, dividing the clumps into small sections; gladioli, dahlias for early flowers, seedlings and seeds of tender annuals may also be planted.

VINE DISEASES IN FRANCE.

(*Continued from page* 468.)

F. de Castella, Government Viticulturist.

SWEET OR NOBLE ROT, BLUE MOULD, &C.

Much attention has been directed in France, of late, to these widely distributed moulds which, like Anthracnosis, have always existed in Europe (and in Australia), and are not introductions from America. Owing to wet vintages, which have frequently been experienced in France of late years, much damage has been caused by them. Most of the decay occurring in our own grapes this season has been due to the same familiar moulds. Sweet or Noble Rot is usually known in French as *Pourriture grise* (grey rottenness, which must not be confounded with *Rot-Gris*, one of the forms of Mildew). It is caused by the widely distributed fungus known to science as *Botrytis cinerea* (syn. *Sclerotinia Fuckeliana*), whilst blue mould is the well known *Pencilium glaucum*.* The former, in the exceptional case of certain white wines, notably those of Sauternes and the Rhine, brings about an improvement in quality of the wine, whence the name Noble Rot. In the majority of cases, however, they are most undesirable. Red wines are never improved in this way, but suffer damage to their colour, which becomes unstable, owing to the presence of *Diastase*, a soluble ferment secreted by the mould. Such wines are subject to the disease known in French as *Casse*. . . . Blue Mould is always injurious to quality, even in the special white wines above referred to. The mode of development of these fungi is dealt with by Mr. McAlpine in the publication already referred to.

In France, the most effectual method of guarding against these grape moulds is by preventive sprayings with Bordeaux mixture or similar copper sprays. The supplementing of these by copper containing powders, in very wet seasons, has proved most beneficial.

WHITE ROT (*Charrinia diplodiella*).

This is another fungus of American origin, which is in some seasons responsible for damage in France. It is, however, of far less importance than the diseases mentioned above, since only berries previously bruised by hail or damaged by insects are invaded by it. After a hailstorm, not sufficiently severe to seriously damage the fruit, spraying with a copper spray may be necessary to protect the fruit against White Rot. The fungus causing it, which was long known as *Coniothyrium diplodiella*, has not been observed in Australia.

ROOT ROT OR POURRIDIE.

This troublesome disease, against which the most effectual treatment consists in improving the drainage of the soil, is not unknown to us in Victoria, where it is responsible for far greater damage than it is usually credited with.

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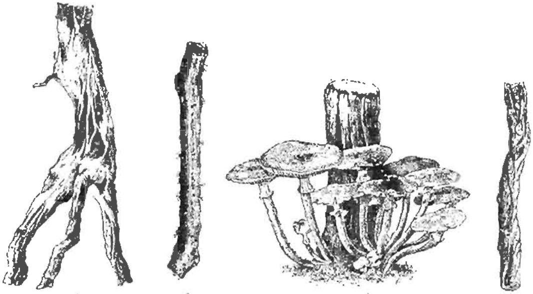
* See *Additions to Fungi on the Vine in Australia*, M'Alpine and Robinson, pp. 29-37, &c.

It is not due to a single fungus, but to a group, one or other of which may be responsible for the damage, the outward manifestations of which, so far as the mouldy appearance on the roots and the injury to vegetation are concerned, may be very similar.

It is chiefly mentioned here because the fungus responsible for the disease with us, so far as has been yet ascertained, is only one of the group which attack the roots of the vine in France.

Here we are familiar with *Armillaria mellea*, which frequently works injury in our orchards as well as in vineyards. This fungus is also known in France (usually under the synonym of *Agaricus melleus*), but it is considered, in that country, to be of less importance, as a cause of the disease, than *Dematophora necatrix*, a quite distinct fungus, which does not appear to have been observed in Victoria. Another species, viz., *D. glomerata*, also attacks the roots of the vine, mainly in sandy but unduly wet soils.



1 2 3 4

POURRIDIE.

1. *Dematophora necatrix* on roots. 2. Same, showing fructifications of fungus.
3. *Armillaria mellea*, fructifications. 4. Same fungus on root (after Vialla).

Several root fungi usually looked upon as saphrophytic or only parasitic to a slight extent, may, under certain circumstances, become injurious. Such is the case with *Fibrillaria*, usually considered to be a harmless fungus, but which has been observed to damage young vines in the nursery.

* * * * * * * * * * *

Many other fungi* attack the vine in France, but it is impossible to mention them here. In the above lines, the most important only could be referred to. Sufficient has been said to show the seriousness of the difficulties French vine-growers have to contend against, and the great advantage enjoyed by Australian viticulture, thanks to our dry atmospheric conditions.

The loss of half the vintage of 1910 in France is mainly due to fungus diseases—in certain districts the loss amounted to as much as 90 per cent.

(To be continued.)

* Amongst these, three which are somewhat similar in their outward manifestations, are deserving of passing notice since the black spots they cause on the leaves might give cause for alarm. *Septoria ampelinum* is responsible for the disease known in France as *Mélanose*. *Cladosporium viticolum*, and *Septosporium Fuckelii* are usually referred to by their generic names. Even in the moist French climate the damage done by these fungi has hitherto been insignificant. *Aureobasidium vitis* (*see Additions to he Fungi on the Vine in Australia*) is also known, but the damage caused by it in France is only slight.

VICTORIAN EGG-LAYING COMPETITION, 1911-12.

CONDUCTED AT BURNLEY HORTICULTURAL SCHOOL.

(Continued from page 565.)

H. V. Hawkins, Poultry Expert.

No. of Pen.	Breed.	Name of Owner.	Eggs Laid during Competition. April to June.	July.	Total to Date (4 months).	Position in Competition.
12	White Leghorn	W. G. Swift	366	113	479	1
40	..	A. J. Cosh (S.A.)	338	132	470	2
31	..	R. W. Pope	337	113	450	3
33	..	Wooldridge Bros. (Qld.)	317	86	403	4
18	..	S. Brundrett	274	112	386	5
37	..	E. Waldon	268	101	369	6
20	..	H. McKenzie	268	95	363	7
13	Black Orpington	D. Fisher	226	122	348	8
32	Silver Wyandotte	M. A. Jones	204	114	318	9
21	White Leghorn	R. L. Appleford	274	43	317	10
46	Black Minorca	G. W. Chalmers	224	89	313	11
63	Black Orpington	A. J. Treacy	182	128	310	12
66	White Wyandotte	J. E. Bradley	207	102	309	13
25	White Leghorn	B. Mitchell	180	121	301	14
44	Black Orpington	T. S. Goodisson	233	67	300	15
51	White Leghorn	J. W. McArthur	180	108	288	16
36	..	F. A. Sillitoe	230	54	284	17
55	..	W. G. McLister	186	97	283	18
39	..	A. W. Hall	176	98	274	19
1	..	A. Brebner	182	91	273	20
67	..	C. L. Sharman	185	81	266	21
9	..	J. O'Loughlin	177	87	264	22
10	Black Orpington	H. A. Langdon	153	110	263	23
24	White Leghorn	F. Hannaford	174	84	258	24
2	..	E. P. Nash	222	35	257	25
19	..	A. Jaques	186	62	248	} 26
22	Black Orpington	P. S. Wood	138	110	248	}
5	White Leghorn	L. C. Payne	144	95	239	28
38	..	Mrs. C. R. Smee	123	115	238	29
4	Golden Wyandotte	H. Bell	108	125	233	30
3	White Leghorn	K. Gleghorn	141	90	231	31
8	..	T. W. Coto	183	46	229	32
27	..	Hill and Luckman	149	76	225	}
42	White Orpington	P. Mitchell	87	138	225	} 33
58	Faverolles	K. Courtney	144	81	225	}
54	White Leghorn	F. Hodges	142	81	223	36
65	..	H. Hammill (N.S.W.)	165	57	222	37
41	..	Morgan and Watson	110	111	221	38
50	..	C. H. Busst	125	89	214	39
47	..	C. W. Spencer (N.S.W.)	157	50	207	40
28	..	J. Campbell	111	87	198	41
49	..	W. J. Thornton	135	62	197	42
45	..	T. Kempster	174	13	187	43
60	..	J. J. Harrington	112	69	181	44
43	..	W. B. Crellin	94	85	179	45
59	..	W. H. Dunlop	99	78	177	46
23	Golden Wyandotte	G. E. Brown	108	57	165	47
11	Brown Leghorn	F. Soncum	81	83	164	48
26	White Leghorn	F. Seymour	82	77	159	49
30	Black Orpington	Rodgers Bros.	138	18	156	50
62	White Leghorn	P. Hodson	130	24	154	51
53	..	A. Stringer	43	109	152	52
16	Silver Wyandotte	Miss A. Cottam	105	42	147	53
34	White Leghorn	E. Dettman	79	66	145	54
57	..	G. E. Edwards	83	54	137	55
6	Silver Wyandotte	Mrs. H. J. Richards	80	55	135	} 56
52	White Leghorn	W. J. McKeddie	32	103	135	}
7	..	H. Stevenson	75	55	130	58
61	Silver Wyandotte	J. Reade	21	88	109	59
35	White Leghorn	I. H. Brain	18	73	91	60
17	..	W. J. Eckershall	27	59	86	61
14	Black Orpington	W. J. Macauley	32	50	82	62
56	White Leghorn	Mrs. C. Thompson	39	39	78	63
15	Black Minorca	H. R. McChesney	15	29	44	} 64
64	White Leghorn	J. D. Read	15	29	44	}
48	Black Minorca	G. James	..	15	15	66
			9,793	5,228	15,021	

The first four months of the Competition, known as the Winter Test, closed on 31st July. All pens qualified as far as the rule regarding weight of eggs was concerned. The minimum (24 ozs. per doz.) was far exceeded in many instances, many of the pens giving as high as 28 oz., notably those belonging to Messrs. Brebner, Brundrett, Campbell, Coto, O'Loughlin, and Seymour, all White Leghorns (white eggs). Amongst the heavier breeds, the pens of Messrs. Fisher, Goodisson, Rogers and Wood (Black Orpingtons), and Mrs. Jones (Silver Wyandottes) deserve mention (brown eggs). During the period under review, 62 double-yoked, 18 soft-shelled, and 8 under-weight eggs (under 1½ oz.) were laid. Total eggs laid, 15,121; market value, £104 17s. 6d.

The prizes offered by the Department of Agriculture for the greatest number of eggs laid during the winter months were won by Mr. W. G. Swift, (Victoria), (First Prize, £4 4s.) and Mr. A. J. Cosh, South Australia, (Second Prize, £2 2s.), their pens laying 479 and 470 eggs respectively. Messrs. R. W. Pope and Wooldridge Bros. were third and fourth with the creditable scores of 450 and 403 eggs. It will thus be seen that Victoria was first and third, South Australia second, and Queensland fourth.

Visitors are reminded that the visiting days are Wednesdays and Saturdays from 2 to 4 p.m. Cards of admission may be obtained on application to the Director of Agriculture. On no account will visitors be admitted on Sundays. Hawthorn is the most convenient railway station.

ANSWERS TO CORRESPONDENTS.

The Staff of the Department has been organized to a large extent for the purpose of giving information to farmers. Questions in every branch of agriculture are gladly answered. Write a short letter, giving as full particulars as possible, of your local conditions, and state precisely what it is that you want to know. *All inquiries forwarded to the Editor must be accompanied by the name and address of the writer.* This is very necessary, as sometimes insufficient information is furnished by the inquirer.

REPAIRING "WATTLE AND DAB" OUTBUILDINGS.—F.B.L. states that some of his outbuildings with walls of "wattle and dab" are, owing to the recent wet weather, falling into disrepair. He asks whether lime and sand mortar (4 parts of the latter to 1 of the former) would serve to remedy matters.

Answer.—The mixture referred to depends upon the sand. If very clean and fine, use 3 to 1; if a little loamy, the lime proportion may be diminished. An addition of a little cement is desirable.

PAINTING FARMYARD FENCES.—A.S.O'K. asks for name of cheap paint for outside yard fences, &c. He states that his horses have eaten all the gates painted with white lead.

Answer.—"Indeliblo" or other cold water paint. Smearing the woodwork after the paint is dry with a strong solution of Aloes is recommended. The solution may be washed off when the habit is broken.

CASTRATION OF HORSES.—C.P.K. asks what is the correct age for castration of horses. Also asks for reasons.

Answer.—There is no correct age, but is usually performed at one year old. The reasons are—because it is convenient; entire colts frequently become a nuisance; and the operation is probably less severe than when the animal gets up in years. It is advantageous to backward colts to leave them until two years.

DEATH OF WETHERS.—C.C. McC. states that on several mornings he has found one or two well conditioned wethers lying dead. They seem to die without a struggle and are very much blown; in fact, a few hours after death it is impossible to skin them. The skin is a dark greenish colour.

Answer.—The symptoms noted are not sufficient to make a diagnosis. It would be advisable to consult a veterinary surgeon or to report to the local stock inspector. Name and address should have been furnished. *See* instructions.

VALUE OF THE ESCUTCHEON.—Cow Man desires information regarding the value of the escutcheon as a guide to the probable milking qualities of dairy stock.

Answer.—See article on page 585 of this issue. "Cow Man" is reminded that each inquirer must furnish his full name and address.

PICKLING WHEAT.—A.E.D. asks whether pickling in icy cold water will deteriorate wheat. *He states that some of his crop is a sickly brown colour, and very sparse.*

Answer.—The temperature of the water would have no effect on the germination of wheat. Bluestone pickle destroys a certain percentage of the seed, especially if left too long in the solution. The proper time to soak one bushel in a 2 per cent. solution is about two minutes. The colour and thin appearance of the late sown wheat may be due to too deep sowing, or to the land being in very wet condition.

SKINLESS BARLEY.—E.B. inquires as to the merits of skinless barley for fodder purposes.

Answer.—Skinless barley makes first class green fodder.

LUCERNE.—A.S.O'K. asks what is the best time for sowing lucerne.

Answer.—The best time to sow lucerne where the frosts are not very heavy is in the autumn, provided the land has been well fallowed and cultivated beforehand and the weeds kept down. A cover crop of oats, at the rate of ½ to ¾ bush. per acre, will protect the young plants to some extent. If this system is followed the whole should be cut for hay at a fair height (6 in.), otherwise the crown of the lucerne is liable to be cut off and the young plants too suddenly exposed to the sun and their growth checked. If, however, frosts are not severe and the land in good order, no cover crop should be used. Spring sowings in fair rainfall or under irrigation, are good, the land again being well worked and clean, as weeds spoil more settings of young lucerne than anything else. From 8 to 15 lbs. of seed is sown, according to fancy; it is better to have lucerne on the thick side than too thin. Thinning out is seldom required. After each cutting a cultivator or harrows should be used to break the surface soil.

RAPE.—A.S.O'K. inquires *re* cultivation of rape.

Answer.—Rape is sown in the autumn and spring at the rate of 4 to 6 lbs. per acre. A dressing of 40 lbs. of bonedust is a great help to the crop. Dwarf Essex is the best variety to use, and it should be sown on a dry seed bed.

SWEDE TURNIPS.—P.H. (Woodend District) asks when swede turnips should be sown.

Answer.—Swede turnips can be sown in August and September for a summer crop, and in April and May for a winter crop.

FOWL MANURE.—F.R. writes:—How does fowl manure compare with superphosphate? Is there any market for it?

Answer.—It is not so highly nitrogenous as guano of sea-fowl origin, owing to the difference in the food supply of the birds, but it possesses certain fertilizing properties. Superphosphate is a phosphatic manure only, and for that reason it cannot be compared with fowl manure. The latter contains all plant foods and is worth about 25s. per ton. There is no special market for it. The fresh manure contains:—

	Per cent.		Per cent.		Per cent.
Water... ...	56	Phosphoric acid	1·5 to 2	Lime ...	... 2 to 2·5
Organic matter...	25	Potash ...	0·8 to 0·9	Magnesia	... 0·75
Nitrogen ...	1 to 2				

COAL ASHES.—G.B.L. asks whether any benefit will be derived from spreading coal ashes on vegetable plots which he is preparing for spring sowing. He has been informed that coal ashes have caused scab in potatoes.

Answer.—Coal ashes contain about one-tenth per cent. of potash and about the same quantity of phosphoric acid. Consequently, as a manure for vegetable crops, they are practically worthless. Occasionally, provided they are not used in too large a quantity, they may have a certain opening effect on the soil. Heavy or frequent dressings will be injurious, and perhaps the best use for coal ashes would be to put them on the footpath. Wood ashes would fulfil the purpose mentioned. Heavy dressings of coal ash will cause scab in potatoes.

WOOD ASHES.—J.O'B. inquires whether wood ashes would be of any benefit to vines.

Answer.—Ashes are undoubtedly of manurial value to vines on account of the potash they contain, which is in the form of carbonate. They also improve the physical nature of the soil. The value varies considerably. The ashes from small twigs are of greater value than those from solid wood.

URINE.—A.W.T. asks whether the washings of the pig styes, which consist largely of urine, may be placed around fruit trees.

Answer.—To prevent any deleterious effect on vegetation, urine should if possible be kept for some time in a tank and reduced considerably with water before applying to the growing plant. If this is done no danger will follow, but certain advantages from its use will be reaped.

SAWDUST.—W.J.R. asks whether sawdust will have any ill effects on orchard soils.

Answer.—Sawdust should be mellowed or rotted down before being ploughed into orchard soils, otherwise some of the resins contained in it may injure the roots. It could be mellowed by using lightly as a mulch, by mixing with lime, or by using as stable bedding and allowing it to afterwards rot. If it could be burned, the ash would be far better for orchard use. In either case, it would ultimately tend to lighten soils.

BLACK SCALE AND SOOT ON ORANGE TREES.—A.W.T. asks whether spraying may now be carried out; and, if so, what strength should be used.

Answer.—Red oil emulsion—1 in 35. Spray now, choosing a cloudy day. To make emulsion, boil 1 gallon of water and 2 lbs. of soft soap until soap is dissolved. Add 2 gallons of red oil. Bring mixture to the boil; and, by pumping the oil back upon itself through nozzle of spray pump, emulsify it. The emulsion should then thoroughly mix with cold water. Fumigation when the young insect comes out is by far the most reliable remedy. Insect pests and fungus diseases of citrus trees were dealt with on page 520 of the August *Journal*.

STRAWBERRIES.—E.A.W. states that some strawberry plants which she has had for two years do not yet show signs of bearing fruit, although looking particularly healthy.

Answer.—Some varieties of strawberries do not bear until they are well established. In the case mentioned they may have been planted from weak runners or from old crowns; both are bad planting methods. Another cause may be the fact that the plants do not bear pistillate flowers, or they may require other varieties for fertilization.

STRAWBERRY FLY.—W.H. inquires as to treatment recommended for the Strawberry Fly.

Answer.—Spray plants with Benzole emulsion—1 in 5. The smell will remain on the plants for some days, but no danger to the strawberries will result.

RIBBED CASE MOTH.—E.L.I. states that his gum trees have been attacked by caterpillars. Specimens forwarded.

Answer.—The specimens sent are the caterpillars of the Ribbed Case Moth. Spray with arsenate of lead or Benzole emulsion.

TARPAULINS.—F.R. asks how tarpaulins are made waterproof.

Answer.—Tarpaulins may be made waterproof by saturation (preferably) or by painting the canvas with a solution made as follows:—10 lbs. of vegetable black; 20 gall. of raw, and 20 gall. of boiled linseed oil. Mix thoroughly; then coat as above and afterwards allow to dry thoroughly.

HARD SEEDS.—J.R.M. refers to article on "The Nature and Uses of Hard Seeds" which appeared in the December, 1910, *Journal*. He asks to what temperature the water should be raised when soaking hard seeds such as Black Wattle, Lightwood, &c., in order to secure a good germination.

Answer.—Perhaps the best practical method of dealing with hard seeds is to pour a large quantity of boiling water over them and then leave them to cool in the water. If, on the following day, only a few of the seeds are still hard and unswollen, the seeds can be planted immediately. They should not be allowed to dry again or be planted during very dry weather or in very dry soil. If the seeds are kept in boiling water for any length of time, the "soft" ones will swell and are then killed by a temperature exceeding 70 to 80 deg. centigrade. Hence, unless the water has fallen below this temperature before the seeds begin to swell, the gain in germination of the hard seeds may be more than balanced by a loss of germination in the softer seeds, if the sample is a mixed one.

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PROPAGATION OF FRUIT TREES.

(*Continued from page 648.*)

C. F. Cole, Orchard Supervisor.

BUDDING (*continued*).

The most practicable method for budding fruit trees is that known as the shield or T. To perform this operation, it will be necessary to have a suitable knife with a keen edge. On page 338 are shown two different budding knives. The white handled one has the part for opening the bark to receive the bud situated at the lower end of the handle, while the black handled one has it at the end and upon the upper side of the blade. For all round work the writer prefers the white handled one, but it is purely a matter of what one gets accustomed to. Both answer the same purpose.

Select a part upon the stock to be worked where the bark is smooth, and 2½ to 3 in. above the ground level. Make a cut across the stock penetrating to the sap wood (31*b*); and then insert the point of the knife about 1 in. below the cross cut, and make an upright incision to it. Fig. 32 shows the position of the index finger whilst making this vertical cut so as to insure its being perfectly straight. If this cut is made untrue the operator will find it awkward to place the bud in the exact position.

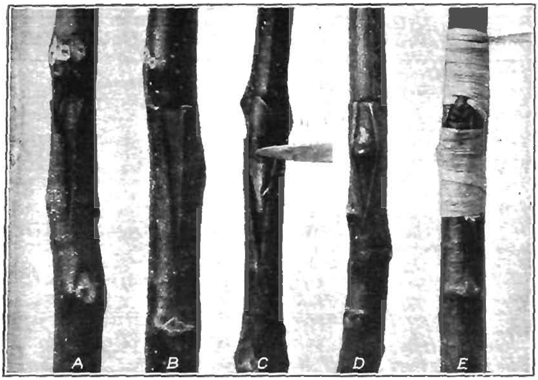
With that part of the knife used for opening the bark, raise the bark upon each side of the upward cut wide enough to allow the bud to be easily slipped into position. (Figs. 31*a* and *b*.) Then cut the bud for inserting. Start about ½ in. below the bud and finish off the same distance above (Fig. 34), cutting deep enough to remove a thin smooth piece of wood upon the underside of the bark containing the bud (35*c*).

Hold the cut bud in position with the thumb and index finger; and, if necessary, with the knife lift the bark slightly at the top of the incision upon the one side. Then insert the lower end of the bud and raise the bark the same upon the opposite side, when the bud should be in position for forcing gently down to the bottom of the cut (31*c*). To do this, place the point of the blade (back part) carefully upon the short piece of the leaf stem; failing this, upon the node, when a slight pressure will

place the bud into the proper position ready for tying (31*c* and *d*). Under no condition, place the point of the blade above the bud, penetrating the bark, or upon the bud. If the bark runs freely, an experienced budder will perform this part with the thumb and finger, *i.e.* when inserting certain kinds of buds.

Having placed the bud in position, take a piece of prepared raffia and start to bind below the incision, working upwards and leaving the bud exposed to the light. Continue binding above the cross or upper cut and finish off with two half hitches. The incision should be well covered and firmly bound (31*e*).

When tying projecting buds, like cherries, be careful not to strike them with the raffia, injuring or breaking them from the node. Injured buds should be immediately replaced by sound ones.



31. METHODS OF BUDDING.

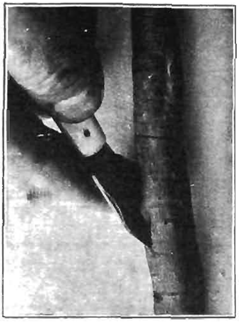
a.b. Incision ready for inserting bud. *c.* Inserting bud. *d.* Bud inserted. *e.* Bud bound.

In illustration 31a, instead of the cross cut, the blade of the knife is pressed downwards. This method is a good one when budding citrus trees, mulberries, etc. The top of the cut, when bound, re-unites with the stock, while the cross cut expands. But, for ordinary fruit tree budding, it has no advantage over the cross cut.

There is another method called the reversed T budding, practised at times. The difference is that the cross cut is made below instead of above, and the bud inserted forced upwards instead of downwards in the stock. Some favour this method when working cherry stocks, stating that they are not so liable to gum if budded this way.

The writer's opinion is that the gumming of cherry stocks when budded is caused by two agencies:—The excessive sap flow at the time that the stocks are worked, and excessive moisture at the roots causing the subsoil to become sodden and cold through bad drainage. If the stocks are budded when they are growing rapidly and over-flush with sap, there is a greater

exudation from the freshly made cut or wound than when the flow in the stocks is normal. Gumming may be shallow or deep seated. If shallow and from the bark tissue, it is not so injurious. If from the cambium or



32. POSITION TO INSURE A STRAIGHT VERTICAL CUT.

33. OPENING BARK TO RECEIVE PREPARED BUD.

wood it is fatal to stock and bud. Cherry stocks should not be budded when the sap is over-free. If so, there is a risk of a poor take of buds—besides gumming. Cherry buds should be fully matured.

Among propagators the methods of making the incision and cutting buds differ. Some make the upward cut first and the cross or down cut last, and also start cutting the buds from above and not below the node. When cutting quickly from above, there is a risk of cutting the buds too short or thin below the node. The foundation of a bud lies in having that portion of the bark, etc., below the node cut well and not less than ⅜ in. in length, if possible. Again, some cut from below, leaving the top portion longer than is necessary. There is a risk, when severing this part so as to make it fit the incision, of injury to the bark, causing the portion above to die back to the wood-bud. This is particularly so with the citrus, mulberry and other tender kinds. With a little practice, the operator should be able to cut the buds to fit the incision, and not have the upper portion long and projecting above the cross cut when inserted.

34. CUTTING A BUD.

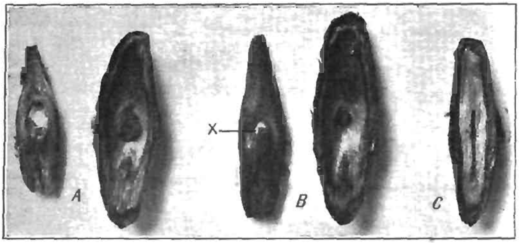
Various methods of tying are in vogue. All answer the one purpose, but after years of propagating by the method already advised the writer finds it to be the best. Besides being quick, it facilitates work, if

2 B 2

performed rightly. The practice of tying off below the inserted bud is not a good one. If neglected, the rapid expansion of the stocks, especially early worked ones, will cause the binding where finished off to cut into the bark and growing wood; probably with the first heavy wind it will break off short, the bud being lost.

If, on the other hand, the expansion of the stocks is not great enough to cause cutting in, it will be necessary when cutting off the stocks above the buds, in the winter or early spring, to release the tied portion of the binding so as to prevent injury. During the time spent over this another stock could be cut off.

By tying off above the bud, as shown in No. 31*c*, the binding, owing to the gradual expansion, will break away below the bud or where tying was first started. If, through neglect, the cut in part is not released, and the stock breaks off, it will be above the bud and little or no harm done. It practically means that only a percentage of early budded stocks will require attention by finishing off above; instead of all, early and late, if tied below.



35. METHODS OF PREPARING BUDS.

a. Wood removed from cut bud with leaf trace bundle left behind. *b.* Wood showing leaf trace bundle (*x*) removed from cut bud. *c.* Cut bud showing wood-method recommended.

The time that it takes to go over thousands of budded stocks, about three weeks after being worked, to release every bound stock when tied below, or the time lost in removing this portion of the bandage when cutting off the stocks, can be saved and put to better advantage.

With buds, even if well cut or inserted, there is a big risk of failure if the binding is not done well so as to prevent the air having free access to the callusing parts until unity has thoroughly taken place. The most particular part is the top of the incision and where the bark was first raised. If the top portion of the binding becomes loose before unity has properly taken place, and even after, the bark will open out, causing the buds to die, particularly if the weather is hot or windy.

Bindings should not be loosened or removed too quickly. The best guide is not to interfere with the buds until obliged to do so, *i.e.*, if they have taken, and there is no necessity to re-bud.

If re-budding stocks owing to failure, insert bud upon the opposite side of the stock and below where the sap has been checked through cutting in. First remove old binding. Worked stocks are very apt to shove out shoots below the inserted bud. This is brought about by the expansion and the sap flow being checked by the binding.

Only in rare instances should such shoots be removed before the dis-budding season, *i.e.* from deciduous fruiting trees. These shoots carry off, to a certain extent, the ascending sap and help to prevent the buds from making a short summer's growth. Pear buds are very apt to start a growth soon after unity takes place; releasing the binding, when safe to do so, and allowing a free flow of sap to the higher parts of the stock will overcome this somewhat. Removing the thin slice of wood from cut buds before inserting is an unnecessary operation, *i.e.* if the buds are cut properly.

If the worked stocks suffer from the want of moisture, even after unity has taken place, those buds with the wood removed and inserted during hot or dry weather are much more liable to die out than those where the wood has been left in. When removing the wood, there is always a risk of injury to the bud; even if injured, unity may take place, only the bud and that portion encircling it dying. The writer has tested both methods side by side and under same conditions. The results have been always in favour of leaving the wood.

36. RESULT OF NEGLECTING THE BINDING.

The manner in which this slice of wood is removed is by inserting the point of the blade beneath the end of the wood and giving a sharp upward jerk. The operation requires practice and care in seeing that the leaf trace bundle is left behind, filling up the hollow at the base or heart of the bud. By starting the removal from the upper end, there is a greater chance of leaving this bundle intact. Fig. 35*a* shows the wood removed from bud with leaf trace bundle left behind (35*b*), leaving an empty cavity at the base or heart of bud. Fig. 35*c* is the bud with the slice of wood left in. Buds that are not thoroughly matured are easily injured by this operation.

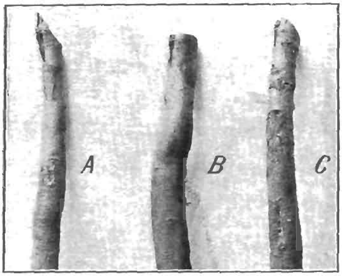
TREATMENT OF BUDDED STOCKS.

During the winter or early spring following the budding season, it is all important, if the propagator wishes to produce a tree from the inserted buds which have united with the stocks, to head the latter back to the bud. The operator should provide himself with a suitable knife (see page 338), a whetstone, and a leather legging. There is always a risk when "cutting off," as this heading back is called, of gashing the leg below the knee. The legging protects the leg and also provides a strop for keeping a keen edge upon the knife. Place the side of the foot, not the toe, against the butt and below the inserted bud, care being taken that the latter is not injured whilst doing so. (If the toe is used there is a risk of causing injury to the bark of the stock to be operated upon. Even the foot is not necessary when cutting off small stocks). Having placed the foot into position, take hold of the top of the stock with one hand, and with the other place the blade of the knife upon the opposite side of the stock to that of the bud and slightly below it. Then make a quick clean upward cut, at the same time giving the stock a slight bend towards the body; the cut should be sloping and finish off slightly above the bud. Both actions should be performed at the same

time. It is surprising how large a stock or bough can be cut off with a small bladed knife with very little exertion.

When cutting off, the operator will be able to hold several cut tops in his hand without inconveniencing him in his work. These should be placed in the alleys between the lands, so that digging, scarifying, or other necessary work may be proceeded with at once. Failing alleys, place in heaps between and parallel with the rows, using one or two rows in a land for this purpose. Tie in bundles and carry out to the headlands where they can be burnt or carted away.

When cutting off, care must be exercised in seeing that a stock carrying a dead or injured bud is not operated upon. Any stock with such a bud is left untouched for future use, *i.e.*, for grafting. With most buds that have taken, *i.e.*, where unity between the stock and bud is perfect, they have a fresh plump appearance. But, if the operator is uncertain, he should test by scratching the bark slightly with the point of the knife either above the bud, or upon the node; the latter test is the surest. Cherry buds are very deceptive at times. The node and shield may be alive, but the bud itself, although looking fresh and retaining its colour, will be dead. The writer followed the practice of not cutting the cherry stocks until the sap was starting to rise and the buds showed signs of swelling. At this period, cutting off and ground grafting can be carried out at the same time.



37. HEADED BACK BUDDED STOCKS.

When cutting off, remove any binding remaining about the bud or around the stock. Fig. 37 (*a*, *b*, and *c*) illustrates common types of cut-off budded stocks. The cut in Fig. 37*a* is made too far below and above the bud; the result is that the portion of the stock left above forces the bud when growing into almost an oblique position, besides dying back to the bud and preventing healing taking place across the wound. In Fig. 37*b*, this cut is made straight across the stock and upon a level with the top of the bud. This is also faulty; the probable result is a growth with a crooked stem near the junction of bud and stock. This wound also takes a long time to heal across.

Fig. 37*c* illustrates the proper method of cutting. Not only will the wound heal quickly, but the closer an upward cut is made to a bud, without causing injury, the more vertical will be its growth. Under no condition, should secateurs be used for performing this work. As there is no occupation in the nursery so severe upon the hands as cutting off, it is a good plan before beginning to bind the handle of the knife with thin rubber.

The first stocks to be cut off will be the plums, *i.e.*, if the tops are required for making cuttings. Then will follow the other stone fruits, apples being the last. After cutting off is finished, carefully remove from

amongst the other stocks any that are small or unbudded and not required for grafting over. Heel them in, trim, and plant out in freshly-prepared soil. Apply artificial manure when planting.

It is not a wise plan to re-bud stocks the following summer when growing amongst yearling trees, as the roots of the budded stocks get cut and bruised when lifting the young trees for planting out in the winter. Besides, the conditions for making growth are not the same. In order to get the best results the above advice should be closely followed.

(To be continued.)

THE NOMENCLATURE OF FRUIT.

E. E. Pescott, Principal, Horticultural School, Burnley.

Introduction.

In the science of Horticulture, no section provides so interesting, so entertaining, and so instructive a study, as the study of Pomology. It affords an immense scope for thought, and is in itself a life-study. When one considers all the kinds of fruit, and all the varieties—both multiplying with the increasing years—there looms up at once the thought that here is a section, a science in itself, so varied, so full of change, with so much room for observation, that he is at first reluctant to enter upon this study. Immediately, the interesting side of the work appeals, and gradually one is led into working up a most entrancing and instructive science.

Of varieties of apples alone, the total number extends into thousands, and the number is increasing each year. It will thus be seen that a student of Pomology is undertaking no light task when he enters upon the work. The sub-section of Fruit Nomenclature, too, gives ample room for thought —why fruits are so named, who grew and named them, what the names mean, why they have so many synonyms; these and other questions crowd thick and fast upon one.

Fruit Names.

It is quite right that each variety of fruit should have a name, and it is only natural that the man who raises a new kind should have the privilege of naming it; but it is just here that trouble is likely to ensue, and serious trouble. A man in an obscure country district raises a new fruit—either by a chance seedling, by cross-fertilization, or perhaps he comes across a good bud variation or sport. He finds his result to be good; he gives scions to his neighbours; or, may be, he sells the whole stock to a nurseryman for commercial usages. Then the new fruit is given a name. Probably, neither the raiser nor the nurseryman knows but little of pomology, and as a result the fruit is given a name which is already in use. Then, in a few years, confusion, and irritating confusion too, arises. This has really occurred; and not only in fruit, but also in flower nomenclature. A permanent committee, with power to revise names, would prevent all this.

Again, a nurseryman may go in for raising new varieties as a specialty; but, unfortunately, his ambition is to prefix or to suffix each variety with his own surname, and he gives to the world perhaps twenty or thirty varieties

of fruits with his name as an addition to the fruit name; and thus we have Smith's Red apple, Smith's Superb plum, Smith's Superior plum, Madam Smith, Bergamot Smith, Smith's Scarlet, and so on—Smith, of course, being here used impersonally. We actually have an "Early Rivers" apple, peach, cherry, nectarine, plum, and damson; a "Thomas Rivers" apple and peach; a "Dr. Hogg" peach, pear, strawberry, and grape; and a "Coe's Golden Drop" apple and plum.

It is only fair to a man to credit him with a desire to hand down his name to posterity in one or two good fruits; but it becomes tiresome and confusing when he wishes to prefix or suffix his name to every fruit he produces, no matter how good it may be. There is the useless and unnecessary multiplication of words; and, in the American Pomological Association, such names are not allowed, only in very exceptional circumstances.

We must not credit everybody with the desire to err in multiplicity of naming fruits. It is just possible, in fact, it has happened, that growers in different parts of the world, and at different times, obtain equally similar results. A case in point is that of the Plumcot, a hybrid fruit raised recently in America by Luther Burbank. Burbank raised this as a cross between the plum and the apricot. The fruit is as large as an apricot, with a deep purple velvety skin. It possesses an apricot-plum flavour, and has attributes of both fruits. Yet it is known that, in two places in Victoria at least, trees almost exactly similar to the plumcot have existed for many years.

Another instance is just as remarkable. Bakehouse's Bergamot is a pear introduced from Tasmania many years ago by the late Mr. Wm. Elliott. It is a remarkably fine flavoured fruit of excellent quality, and has been much admired as an exceedingly superior pear. This year, an amateur grower of Oakleigh submitted to me some pears for an expression of opinion. The pears were grown on a seedling tree which was raised from seeds of a late culinary pear. My report on the pear was to the effect that, as the fruits were exactly identical in appearance, quality, and flavour with Bakehouse's Bergamot, it was not advisable to retain the pear as a separate variety.

It is thus seen that Nature, in different parts of the world, repeats her successful efforts.

Confusion.

Two instances might be quoted as to how confusion will frequently arise. For many years orchardists have been growing the well-known apple, Stone Pippin, which is deservedly considered one of our finest winter fruits. The origin of its name, Stone Pippin, is obscure, as it is certainly not the true Stone Pippin—this apple is of Scotch origin, and is correctly known as Gogar Pippin, which is most unlike our Stone Pippin, being a true dessert apple of sweet flavour. The colonial Stone Pippin is really an apple of German descent, known as Grüner Fürstein. Possibly, some early German colonist brought the apple from the Fatherland, and, from its hardiness, it received the sobriquet of "Stone Pippin." There are three old English apples, known respectively as Birmingham Stone Pippin, Norfolk Stone Pippin, and Somerset Stone Pippin. The colonial Stone Pippin, or, more correctly, Grüner Fürstein, while it does not accurately answer to the description of any one of these apples given by English pomologists, yet in certain features it bears a resemblance to the

three, and more particularly to the Somerset Stone Pippin. Thus, probably some of the early growers, noting this resemblance, named it Stone Pippin.

Again, we have our very excellent dessert apple, Cleopatra, or New York Pippin. Over forty years ago, Mr. Wm. Clarson, the then Director of the Burnley Gardens, in writing of the apples in the Burnley collection, recorded of this apple "true name not known." It is certainly not Cleopatra, for there is no recorded apple of that name; neither is it New York Pippin, for the true synonym of that apple is Ben Davis. The correct name is Ortley, under which name it is largely grown in America.

To further instance how confusion in names and varieties may occur, it is interesting to recall the introduction of the apple Jonathan into Victoria. This popular apple, which was raised in the New York State, was ordered from America by the Royal Horticultural Society of Victoria some forty years ago. On the tree fruiting at the Burnley orchards, it proved to be Esopus Spitzenburgh; at the same time, the tree imported as Marston's Red Winter was found to be wrongly named—it was really Jonathan. This caused much confusion, until fresh importations of Jonathan trees showed it to be the same tree that was previously imported as Marston's Red Winter. In America, Jonathan is variously named King Philip and Philip Rock, in honour of the man on whose farm the original tree grew.

Wickson also refers to this question in his remarks on the introduction of the prune d'Agen into California. In 1856, scions of the French prune were introduced into California from Agen in France by some French settlers. The growers were disappointed that the resultant prunes were smaller than the commercial French prunes. Because of their smallness, these growers named these prunes the Petite Prune d'Agen. Trees of a larger supposed prune were imported and sold as Gros Prune d'Agen, adding a German word to the French name. When shown that if it were a true French prune, the French would have used the French word "grande," and not the German word "gros," the importers said that the prune was really German, and was known as the Hungarian prune. And, as a matter of fact, the new prune happened to be neither French, German, nor Hungarian, but the old English plum, Pond's Seedling. Still, this did not suffice, and a Californian grower visiting France made a special study of the question, with the result that the original variety proved to be the prune d'Agen. In their further search for a larger prune, the Robe de Sergeant was introduced. This again led to confusion; as while Robe de Sergeant was a synonym of prune d'Agen, this newly introduced fruit was different again from d'Agen. In this case, it was ultimately found that d'Agen runs larger in various districts and soils, and that in the last case, it was the larger variety that was introduced.

Thus, Prune d'Agen, Petite Prune d'Agen, Gros Prune d'Agen, Hungarian Prune, French Prune, Pond's Seedling, and Robe de Sergeant—seven names, all supposed to be different fruits—really were only two separate fruits. And the confusion still exists, and requires elucidation; for, while both Hogg and Downing give Prune d'Agen and Robe de Sergeant as synonyms, Wickson illustrates them as two different fruits. Then, in Victoria, it is possible to buy trees of Angelina Burdett and Prune d'Agen, and, when they yield, the fruit is absolutely identical.

There is growing in an orchard in the Eltham district a remarkably fine late dessert apple, quite distinct from anything else we have. The apple is well worthy of cultivation for its superior qualities. Local growers name

it "Ford's." On inquiry, it was found that the apple was so named owing to the fact that the original tree was growing in a garden which was owned many years ago by a Mr. Ford, who is supposed to have planted it there. Mr. Ford was communicated with, and he stated that the late Mr. Charles Draper had imported the tree from America many years previously, and, as a special favour, had given him two grafts, which he worked on an old tree. He never knew its name. At present it is impossible to trace this apple. So far as can be ascertained, it is not in the Burnley collection; but, when the apple is recognized, and its proper location found in pomology, it will still be known to the old growers as "Ford's," while by the newer growers it will be given its correct name.

SIMILARITY OF NAMES.

It is still a subject for wonder to the uninitiated that River's Early Peach, Early Strawberry, Blenheim Orange, and Liveland Raspberry are apples; that Peach is a pear; that Peach and Royal Orange are apricots; that Sultana is an almond as well as a grape, and so on.

We have Norfolk Beauty, Norfolk Bearer, Norfolk Beefing, Norfolk Colman, Norfolk Paradise, Norfolk Stone Pippin, and Norfolk Storing; and we also have Beurrés, Bon Chrêtiens, Doyennés, and Reinettes in abundance. There is a Mr. Gladstone peach raised by Rivers, of England, and a Mr. Gladstone peach raised by the late Mr. Haley, of Diamond Creek, Victoria. There is a May Duke cherry and gooseberry; a Prince of Wales peach and plum; a Climax apple and Japanese plum; a President strawberry and plum; a Sultan Japanese and a Sultan English plum.

Then, there is the name "Dunn's Seedling." Quite a number of apples are locally given this name; both Munroe's Favourite and Schroeder's Apfel are in different localities given it, while Schroeder's Apfel is sometimes called Munroe's Favourite. The two apples are entirely distinct. Munroe's Favourite, again, is often called Garibaldi—which it is not; Garibaldi is another apple. In New Zealand, Munroe's Favourite is known as Ohinemuri—while elsewhere it is variously known as Gander's Seedling, Golden Cup, &c.

Then there is the well known apple previously referred to, called Cleopatra, or New York Pippin. Where these names came from is not known. This apple is certainly Ortley, which is so largely grown in America. Ortley enjoys twenty-two other synonyms in America and two more in England; and adding its correct name, together with our two Australian ones, this popular American apple carries no less than twenty-seven names. No wonder it is popular.

Again, New York Pippin in America is identical with Ben Davis; while Ben Davis has for another synonym Kentucky Red Streak, which is not the Kentucky Red Streak grown here. The apple known as Scarlet Pearmain in Tasmania is the Scarlet Nonpariel in Victoria, while American and English authorities quote these names as two separate varieties. The London Pippin is more often called the Five Crown Pippin, erroneously so according to correct nomenclature; although the latter more correctly describes its appearance, and would be a more suitable name.

Thus, even with apple names, we might well pause and ask where we are. Enough has been said on this subject to show how great a muddle exists. One cannot be too emphatic in condemning such nomenclature, and

these anomalies should never have been perpetuated; they would not have been perpetuated had a permanent nomenclature committee been in existence in each country.

In some of the instances mentioned above, it will frequently be impossible for purchasers to obtain, and certainly impossible to define, the variety they desire. Thus, the loss to the grower, who waits years for his trees to fruit, and then finds that he has a variety not wanted, and so either has to grow an unsuitable fruit or replace his land, is incalculable.

Long Names.

Still another fault is the great length of names sometimes given to fruits. Frequently it may be taken, although not always, that a big name is synonymous with inferiority. And so we have Borsdorffer Strié de Bohème apple; King of Tomkin's County Pippin apple; Twenty-fifth Anniversarie de Leopold I. pear; Citron-bèrne Bömische grosse punitirte pear; Grosse Weiss und Rothgestriefte Johannesbeere currant; Mirabelle von Flotow's gelbe fruhbe quetsche plum; &c.

Synonyms.

There has thus crept into commercial life such a cumulation of names that it is a wonder that people know which fruit to order. Some of our popular and well known varieties of fruits carry a great number and diversity of names. For example, in apples, the old Buckingham is known under 24 names; Fallawater, an American favourite, owns 18 names. Ortley admits no less than 27, while Nickajack is the possessor of 38. In pears, the same multiplication exists, thus Beurré Diel has 24 names; Flemish Beauty 29; Uvedale's St. Germain 36; (and this must not be confounded with the variety St. Germains, which is a different pear, and has itself 14 names). The list is topped by White Doyenné, or Doyenné Blanc, which answers to no less than 39 synonyms.

The Remedy.

The remedy will only be achieved by unanimity of action between officials, fruit-growers, and nurserymen. The adoption of a standard list is the first necessity, and for the older varieties we have such authorities as Hogg, Downing, and Thomas; later we have Wickson, and the reports of the Royal Horticultural Society of England. But none of these authorities deal directly with Australian fruits.

Co-operative action, in the direction of a Pomological Committee, is the only remedy; and nurserymen should agree to sell no variety, fruit-growers to grow no variety, and officials to recognize no variety, that has not received the acceptance of such an association.

The Pomological Association of America has seven rules only, and these are subjoined to show the mode of action, which is reputed to be eminently satisfactory.

Rules Adopted by the American Pomological Association for Naming and Describing Fruits.

1. The originator or introducer (in the order named) has the prior right to bestow a name upon a new or unnamed fruit.

2. The society reserves the right, in case of long, inappropriate, or otherwise objectionable names, to shorten, modify, or wholly change the same when they *shall occur in its discussions or reports*; and also to recommend such changes for general adoption.

3. The name of a fruit should preferably express, as far as practicable by a single word, a characteristic of the variety, the name of the originator, or the place of its origin. *Under no ordinary circumstances should more than a single word be employed.*

4. Should the question of priority arise between different names for the same *variety of fruit, other circumstances being equal, the name first publicly bestowed* will be given precedence.

5. To entitle a new fruit to the award or commendation of the society, it must *possess (at least for the locality for which it is recommended) some valuable or* desirable quality or combination of qualities in a higher degree than any previously known variety of its class and season.

6. *A variety of fruit having been once exhibited, examined, and reported upon,* as a new fruit, by a committee of the society, will not thereafter be recognized as such so far as subsequent reports are concerned.

A rule governing the revision of names was authorized by the Association at its meeting in Washington in September, 1891, as follows:—

Prefixes, suffixes, apostrophic terminations, and secondary words, together with words whose significations are expressed in the descriptive columns of the catalogue, are eliminated from the names of fruits, save in a few cases in which they may be needful to insure the identity of a variety and in a few time-honoured names.

The anglicizing of foreign names is resorted to only in the interest of brevity or pronounceability.

In questionable cases, subsidiary words are retained in parentheses.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, Principal, Horticultural School, Burnley.

The Orchard.

Cultivation.

The necessity of getting a good start is just as important in the orchard as in any other work. The experience of other years has shown that in springtime the ground hardens very quickly, especially in warm or windy weather; and so early ploughing is always a necessity. Even if rain follows the spring ploughing, it will be easy to cultivate afterwards. Although a mild summer has been predicted, this is no reason why ploughing should be delayed. Not only do the weeds need suppressing, but the roots of the trees need air, and the soil requires to be sweetened by the ploughing.

That the season is an early one is indicated by the early blossoming of all kinds of fruit trees. The earliest pear tree in full bloom in the Burnley Orchards was a variety known as "Chinese," and this was in full bloom on the third week of August, while last season it did not reach full bloom until 12th September. Another variety, which was in full bloom on 20th September of last year, was in the same stage on 8th September of this year.

These indications point to an early season; and it will be well to have both ploughing and cultivation completed early, in case the predictions of a mild season should not be realized. Ploughing and harrowing should be thorough; and all weeds and herbage should be well covered, and the surface tilth as loose and clean as possible.

All cover crops intended for green manure should be ploughed in now. These may need breaking down with a disc, a roller, or with a chain on the plough before covering.

Spraying.

Spraying for all pests and diseases is now a preeminent work in the orchard. Bordeaux spraying for black spot of apples and pears; for scab and shothole in apricots and peaches; for leaf curl of peach; and for rust of plums and peaches should now be completed. Where there are indications that previous sprayings have not been thoroughly successful, a second spraying should be given.

Wherever they are present, nicotine sprays should be used to combat peach aphis, and the pear and cherry slug. For the latter pest, arsenate of lead should not be used if the cherries are within a month of ripening. Arsenate of lead is so tenacious, and thus it is likely to remain on the fruit until it is ripe, when it would then be dangerous to the consumer. Thus, while this property of remaining on the fruit for a considerable time is of great value in codlin moth spraying, it is of quite the opposite value when used for cherry slug. Either tobacco water or hellebore is useful for the eradication of this pest, as these substances do not remain long on the trees, and they are quite as effective as arsenate of lead.

Codlin moth spraying, too, will be in evidence this month. Owing to the early season, it is just possible that the development of the moth will take place earlier. It is generally assumed that the appearance of the moth is coincident with the bursting of the flowers. This is not always so—the moths frequently come slightly later than the bloom period.

In 1908, a large number of apples were in full bloom in the Burnley orchards on 7th October, while the first egg of the codlin moth was not observed until the 16th October. At the same time, a number of apples were not then in blossom. In 1910, the greatest number of apples were in bloom about 15th October, and the first codlin moth egg was observed on 21st October. Hence, it will be necessary to spray shortly after the petals fall.

Owing to the rapid expansion of the fruit, it is well to follow the first spraying with a second in a week or ten days' time. Arsenate of lead is still the spray for codlin moth, nothing having been found to supersede it.

General.

Citrus trees of all sorts may now be planted out, care being taken that neither the young trees nor the soil is allowed to dry.

Graft ties will need examining; and, where any growth has taken place, they may be loosened slightly. In hot, dry, or windy weather, the grafts will benefit greatly by an occasional spraying with water. On such days the transpiration of moisture from the foliage is very great, and so far, a perfect union has not taken place; thus, there will be a loss of sap, which can not readily be replaced, and the graft will probably suffer considerably.

Vegetable Garden.

A good tilth, and a well pulverized surface, are the main soil necessities in the vegetable garden this month. Frequent cultivations will keep in the soil moisture, and will obviate the necessity for constant surface waterings. At the same time, it should be remembered that the vegetable garden requires more water than the flower garden, owing to the quick growth of the plants. Quickly grown vegetables are more tender and more luscious than slowly grown ones; thus, a good water supply

will need to be maintained. Weeds are great moisture robbers, and they should be kept rigorously out of the vegetable garden at this time of the year.

Late plantings of tomatoes may now be carried out; all early planted plants should be fed, staked, and the laterals pinched back. A little bonedust or superphosphate may be given, but these are not equal to animal manures, if the latter are available. Chemical manures should only be given in a limited quantity. Six or seven cwt. per acre would be a heavy dressing, and this works out at nearly three ounces per square yard. Vegetable growers may easily try this for themselves, and it will soon be seen that three ounces scattered over a square yard of surface will appear to be a very light dressing.

French beans, carrot, parsnip, celery, radish, peas, and turnip seeds may now be sown. Seeds of cucumber, melon, and pumpkin family may now be sown in the open ground. All seedlings may be transplanted on favourable days, and it will be well to sprinkle the tops when planting out, as well as to water the roots.

Asparagus beds may be top-dressed with manure, and kept well weeded. Such weak growths of asparagus as are not gathered for cooking purposes, although these are invaluable for flavouring and for soups, should be kept cut out of the beds.

Celery trenches will need attention at this season; and, to insure good and quick growth, frequent waterings will be necessary.

Flower Garden.

Flower gardens are troubled with many pests at this season of the year. Rose aphis is one of the most prevalent. Frequent applications of a strong tobacco spray will keep this pest in check. It has been argued that, because this pest disappears on the occurrence of the first hot wind, it is not necessary to worry much about it. This is a very fallacious argument, as the hot winds do not generally come until the aphides have done a considerable amount of damage; and, further, when the aphides do disappear, many of them simply go underground to hibernate until another favourable season.

Rose mildew will also require combating. The bushes should be sprinkled or dusted with sulphur while the foliage is still wet with the morning dew. Dusting sulphur on the ground under the bush is also effective, the sulphur fumes acting as a check on the fungus.

Leaf rolling and leaf eating insects will need to be suppressed by spraying with arsenate of lead or Paris green.

The surface must be kept well hoed, so as to keep in as much soil moisture as possible. Dry soils will need frequent waterings, with a hoeing as soon as convenient after each.

Preparation will now be made for the planting of dahlias and chrysanthemums. The beds should be well dug over two or three times, well mixing the manure with the soil at each digging. The soil must not be too rich, and a well drained condition is an essential.

Bulbs that have finished flowering, and that have lost their foliage should be lifted and stored. The foliage must not be cut off, as this means loss of sap and energy.

Tender and half-hardy and other annuals may be planted out now, for summer and autumn flowers. These include asters, zinnias, salvias, balsams, amaranthus, celosias, &c. Lobelia, bedding begonia, iresines, alternantheras, &c. may now be planted out.

TOBACCO CULTURE.

(*Continued from page 610.*)

T. A. J. Smith, Tobacco Expert.

TENT GROWN TOBACCO.

The term " Tent-grown tobacco " applies only to cigar leaf production. The system is largely in vogue in America, where hundreds of acres of cigar leaf are grown under cover. The object of the system is to produce

TENT-GROWN TOBACCO.

wrapper leaf of thin texture and sound quality. A desirable subtropical effect is insured by means of the enclosure inasmuch as it causes a moist condition of atmosphere combined with a more regular temperature. This makes for a greater rapidity of growth and more delicate flavour. Further, owing to the crop being enclosed with cheese cloth, the damage likely to ensue from the ravages of insect pests and wind is minimized. Sun spots are also avoided.

Yields vary from 1,000 lbs. to 1,400 lbs. per acre of cured leaf, and values from 2s. to 16s. per lb., averaging a return per acre of from £75 to £200, according to the proportion of high grade leaf in the crop.

Experiments in Victoria have proved that leaf of better texture can be grown by this method, but so far the cost of covering the field would not be compensated for at the prices offered by manufacturers for the local product. Later on, when Victorian leaf gets a reputation for being high class, growing tobacco under these conditions may become more general, especially as it makes the industry possible in places where growing in the open field is not advisable.

The structure for the cover is made 9 ft. high and covered on the top and sides with cheese cloth. The frame can be built of poles of any diameter from 4 to 8 in., and placed 12 in. apart, with battens or galvanized wire stretched across the top to support the cloth and to prevent sagging. The widths of cheese cloth should be sewn together and sewn to the battens or wires. The whole cost will be from £60 to £80 per acre; though, where timber is plentiful and the owner's labour available, the cost will be lower. A cheap quality hessian will answer, but it is not as good as cheese cloth; it will have the effect of darkening the interior of the building which is detrimental to rapid growth. The life of the framework is from two to six years, according to the size and kind of posts used, and of the cheese cloth or hessian, two years.

The report of a leading cigar manufacturing firm on Victorian tent-grown leaf is decidedly encouraging. It reads as follows:—

> They are the best samples of Australian cigar leaf we have ever had submitted to us. We would be prepared to purchase immediately a large quantity of such leaf at a price which we believe would be profitable to the producer, allowing for the extra cost of growing under cover.

The harvesting of tent-grown leaf differs from that grown in the open, in that the evidences of maturity are not so plain, and if the crop is allowed to over-ripen the quality will suffer. A record of the dates of topping the plants should be kept, and the crop cut within eight weeks of the time the bud is removed; every additional day over that period the leaf will deteriorate in smoking and burning qualities.

Irrigation of Tobacco.

In view of our present closer settlement policy regarding small irrigated areas, a few hints on tobacco as a crop under irrigation methods should be of value. Seeing that the crop gives such large returns per acre and the area required to irrigate consequently small, no crop should be more suited to small holdings, if soils and climate are right. The greater part of the tobacco produced in the United States of America is grown in fields of from 3 to 5 acres each.

Irrigation for tobacco is practised elsewhere on a large scale, both on small and large areas, but there are a few points that must be observed, otherwise the results will be fatal. In the first place, the soil must be free and well drained to allow of the water getting away from the surface quickly and easily. If the water should lie on the ground for more than 12 hours, the crop is liable to be killed outright at whatever stage of growth it may have attained. Flooding is not a good practice: irrigation by means of furrows between the rows at equal distances from the plants is a safer system. A good watering, with subsequent surface working of the soil before transplanting, is often of great advantage in giving the crop a start. Another watering just before the topping stage, if required, is also advisable. The water should never be put on later than this, as it prolongs the

ripening period which is not desirable. It also has the effect of injuring the cure later on, owing to the destruction of the oxydizing enzymes in the leaf cell. The bad effect will also be felt during fermentation.

Diseases are more frequent and of greater extent in very wet seasons or if too much water is applied artificially. At the same time, water, if judiciously administered as described, will have very beneficial effects in making the growth continuous and be a great safeguard against drought in dry districts. It should be an ideal system for tobacco-growing, as the water supply could be so regulated as to prevent the bad results that follow a too wet season, when the rainfall in the later stages of the growth of the crop is liable to be injurious.

If irrigation is practised, it must be always be borne in mind that cultivation is necessary afterwards, as soon as the land is fit to break the surface. It prevents coldness caused by evaporation, and also the loss of soil moisture through the same cause.

(To be continued.)

VINE DISEASES IN FRANCE.

(Continued from page 652.)

F. de Castella, Government Viticulturist.

Diseases of Doubtful Parasitism.

The vine diseases we have so far considered are due to well defined fungi, the anatomy and life history of which have been so fully studied that methods of treatment are now thoroughly established on a sound and logical basis. The same cannot be said concerning several other diseases which still give rise to much discussion among scientists. The convenient, if often abused, term of *Bacteriosis* has been freely used to explain their causation, apparently with reason in some cases, though it is probable that in others the disease is constitutional, and therefore not amenable to direct treatment. These diseases are usually confined to individual vines, for which reason their effects are far less disastrous than the wholesale invasions of well defined parasitic fungi. Nevertheless, in certain cases, the number of vines affected has been sufficient to suggest parasitic origin, and to at least give cause for serious alarm to the owners of vineyards in which they have been observed.

In view of their probable occurrence in Victoria, it is well to enumerate and briefly describe the most frequent manifestations which, though varying a good deal and often lacking in definiteness, have been given names, each of which is usually understood to stand for a more or less obscure disease.

Vine Apoplexy, or Folletage as it is more commonly known in France, is the most alarming of the group. The vine attacked suddenly fades, the leaves wilt and become flabby, usually in the course of a few hours. Next day, the leaves are crisp and dry, if the weather be warm, and the vine completely dead. The symptoms are exactly as though the main stem of the vine had been severed just below the surface of the ground. Sometimes, a portion only of the vine is affected, an arm or even one half of the vine dying suddenly, the other portion continuing to live. Death of the whole vine is, however, more common. Fortunately,

the number of vines thus attacked is usually very small—only an isolated vine dies here and there, irregularly throughout a block. Even in seasons when it is most prevalent, the total number of vines affected is inconsiderable. Vines in robust health are more apt to be struck down in this way than weaker ones. In fact, it is on rich soil, where moisture is abundant, that the most severe visitations have been experienced. Midsummer, or from the 15th July to 15th August in France (15th January to 15th February in Australia) is the season when apoplexy is most frequent.

The disease has long been known in France. It was described at some length by H. Mares in 1862, or in pre-Phylloxera days, as occurring on ungrafted vines. It appears, however, to occur rather more frequently since reconstitution on resistant stocks. The greater the affinity between stock and scion, the less frequent is this accident. With the usual stocks now in use, such as Rupestris du Lot, the Riparia, Rupestris Hybrids, &c., it is rare for many cases to be noted in a vineyard—with some of the older stocks it was much more frequent. Liability to apoplexy is the main reason which led to the abandonment of Riparia Grand Glabre, for example. This stock, when grafted with Alicante Bouschet, suffered in some cases to such an alarming extent that a new disease was suspected, called, for want of a better name, "*Maladie de l'Alicante-Bouschet.*" With Riparia Gloire, apoplexy is less frequent, though more so than with the stocks now gradually superseding it in France, and which we are now propagating in Victoria.

The cause of this alarming accident, as it is usually considered (in contradistinction to a disease), has long been looked upon as obscure. The usual explanation is that it is the result of a rupture of equilibrium between the water absorbed from the soil by the roots and that transpired by the leaves. Climatic influences seem to have much to do with the occurrence. It is most frequent when dry sunny weather follows immediately after a close muggy spell; especially when there is abundant moisture in the soil. During the close weather, transpiration is less active and the roots, becoming accustomed to sending up a small supply of moisture, then fail to respond quickly enough to the call made upon them when dry, hot atmospheric conditions suddenly supervene. At any rate, this explanation has long been the generally accepted one. Professor Vialla says:—*

> It appears . . . that this sudden death is due to a rupture of equilibrium between transpiration by the leaves and absorption by the roots. Water, being too abundant in the soil, the leaves could not in the moist atmosphere transpire the excess carried to the leaves under the influence of very hot weather. But, more often, Folletage seems to be due to the roots not being able to supply the leaves with as much water as they evaporate. These two opposite causes would lead to the same result.

M. Ravaz, in a recently published article,† attributes vine apoplexy to a Polyporus or tinder-forming fungus; probably *Polyporus igniarius*, which he has found in many of the dead vines. M. E. Vinet has likewise found allied fungi on vines, which have died in a similar manner, in the Anjou district. Two species found by him were identified as *Polyporus versicolor* and *Stereum hirsutum*.‡ It would thus appear that apoplexy is, in some cases at least, due to a parasite.

Though apoplexy may, and probably will, be occasionally observed in Victorian vineyards, it need not cause alarm.§ Our climatic conditions

* *Les Maladies de la Vigne*, p. 472. † *Progres Agricole*, 7th November, 1909.

‡ *Revue de Viticulture*, 16th December, 1909.

§ Some isolated cases very much resembling apoplexy have been brought under the writer's notice in the Goulburn Valley—only a very few vines were affected. See *Journal*, 10th October, 1908.

are different from those of France, and the absence of muggy weather about midsummer is a distinct feature in our favour. We have also abandoned the Riparia stock which is inclined to give trouble in this respect. Even in France, where so many Riparia vineyards are still in existence, it is rare for more than an odd vine to occasionally die, though, as has been stated above, more severe visitations are sometimes experienced.

The manifestations of the disease are so sudden as to lead to unnecessary alarm. Little can be done in the way of treatment. Radical pruning on the first signs of trouble is said to save the vine in some cases, though the year's crop is, of course, lost. Removal of the diseased portion when the trouble is due to fungus invasion, and subsequent treatment with tar, is also said to save the vine.

ROUGEOT.—This seems to be a modified form of apoplexy and to be due to similar causes though it does not result in the death of the vine. The leaves become red and some of the canes die off. Fresh shoots usually take their place before the end of the growing season. The vines recover, though they are of course weakened for a year or two. This disease has also been noticed in California, where it is known as Red Leaf Disease.

BROUSSIN, BLACK KNOT, or CROWN GALL.—This disease, if indeed it can be called a disease, is already well known in Victoria. The peculiar excrescences formed on different parts of the old wood of the vine, especially where it has been damaged by a plough or other implement, though unsightly, do not appear to do much injury. They are, however, a suitable starting place for white ants and other insects, and for this reason their removal is desirable. The cause is obscure; late frosts are sometimes followed by these growths. Though claimed by some authorities to be of parasitic origin, this is not as yet proved.

GELIVURE, COURT-NOUÉ, ETC.—Under these names, as well as such closely allied ones of *Mal-nero*, *Roncet*, *Aubernage*, &c., we have a group of diseases which do not, usually, lead to the death of the vine, but which constitutes an interference with its normal, healthy growth. Though isolated vines are, as a rule, only affected, occasionally the number is sufficient to seriously reduce the yield. Sometimes, vines may eventually be killed, though only after a good many years.

The names given above correspond to rather different manifestations of the same or, at any rate, closely allied causes. With Gelivure, the canes are distorted, and frequently fasciated, especially when they commence to grow in the spring; later on, vegetation is depressed, numerous lateral shoots being produced. After the fall of the leaves the young wood presents an abnormal and, often, discoloured appearance.

If, as frequently happens, the internodes become much shortened, we have the form kuown as Court-noué (short knotted, in French), though there is really no distinct border line between the two.

Should the growth be much depressed, and the canes numerous and weak, Roncet is the term applied.

Sometimes, these accidents have been attributed to the after effects of spring frosts. Often, however, this cause could not be blamed for the disease, which has long been looked upon as obscure; and, even at the present day, opinions differ considerably on the subject.

It appears to be very probable that these manifestations may with reason be classed as different forms of Bacteriosis, since we have no English equivalent of the different French terms mentioned above. There

is, unfortunately, in certain quarters, a readiness to employ the word Bacteriosis as an easy explanation of any obscure plant disease, and for this reason one hesitates before using it. The best French authorities, however, now very generally attribute the diseases under review to the presence of bacteria in the vessels and tissues of the vine. They consider that the infection may be conveyed from diseased to healthy vines by the secateurs used when pruning. They recommend that cuts be disinfected with a 3 per cent. copper sulphate solution, if the disease be at all prevalent. It would appear logical, in such a case, for the pruners to carry a small pot of liquid disinfectant into which their secateurs could be dipped.

Chlorosis.—This disease, which manifests itself by the leaves of the vine being yellow instead of green, especially in spring, and interference with healthy growth generally, is in almost every case due to the action of excess of lime in the soil, on vines grafted on resistant American stocks unsuited for limey soils. Though of little importance in the majority of Australian soils, owing to their low lime contents, the question has been one of vast importance in Southern Europe, and it must be briefly mentioned here. It cannot be gone into in detail, nor is it necessary to do so. In cases where the growth of the vine is very considerably interfered with the disease is often termed *Cottis*.

Brunissure.—This curious disease, which manifests itself by the appearance of dark brown spots or blotches on the leaves after midsummer, has given rise to much discussion. Messrs. Viala and Sauvageau attributed it to the development of a *Myxomycetous* (slime-forming) fungus which they named *Plasmodiophora vitis** in the interior of the leaf cells. Other authorities consider that this discolouration of the foliage is simply due to unfavourable weather conditions, whilst, according to Professor Ravaz, it would be the result of over-production of fruit or, in other words, of overwork by the vine, brought about by excessively long pruning or other causes, such as climatic conditions very favourable to heavy crops. He considers that more than one obscure disease of the vine is due to this cause, and that over-production may in certain cases even lead to the death of the plant. The point is worthy of attention and should serve as a warning against the unduly long pruning of our newly reconstituted vineyards. Overloading of such vines in their youth would certainly be most injudicious, and it would be only reasonable to expect that such would militate against a continuance of heavy yields.

Though in some years Brunissure has been sufficiently prevalent to cause alarm and to result in damage to the fruit, through interference with normal development of the foliage, such severe visitations are unusual in France, where the disease is only an exceptional occurrence. So far, no treatment has been found capable of satisfactorily dealing with it.

Ercissement.—This is rather a climatic affection than a disease, and is the term given to the influence of drought and insufficient summer cultivation. The berries remain small and acquire a characteristic blue tint after midsummer or just about the time when they ought normally to be changing colour. The fruit, when ripe, is small, contains little juice or sugar and yields a wine of poor quality. This would appear to be a less aggravated form of what has been termed "grape shrivel" in California.

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* Professor Viala also attributes the obscure *Anaheim* disease of California to an allied fungus, which he has named *Plasmodiophora Californica*. This view, however, is not shared by Californian authorities. Microscopic observations of these slime fungi are difficult and delicate.

COOL STORAGE GRAPES AT THE ROYAL SHOW.

F. de Castella, Government Viticulturist.

In the viticultural section of the exhibit of the Department of Agriculture at the recent Royal Agricultural Society's Show, some grapes were displayed which had been stored for five months in the Government Cool Stores, with the object of providing an object lesson as to the great future which awaits the fresh grape shipping industry.

Visitors to the Show were much struck with the condition of these grapes. It has, of course, been amply demonstrated that grapes of suitable varieties, properly packed, can be preserved for several months in this way. The large shipments regularly sent to London from Western Australia prove this conclusively, but the duration of storage in the present case was far longer than is necessary for shipment; they had been stored for five months, whereas transport to London only takes five weeks.

The majority of those shown were of the Doradillo variety, this being the only one, capable of withstanding prolonged storage, as yet readily obtainable in Victoria. Considerable plantations of proved "shippers," such as Ohanez, Flame Tokay and Purple Cornichon, which have been recently made, are not yet in bearing. The Doradillo is a less handsome grape than these, though it possesses considerable keeping power.

These grapes were grown by Mr. Grimmond, of Wahgunyah, and Messrs. Young Bros., of Mooroopna, neither of whose vineyards was irrigated; it must, however, be remembered that they were only gathered after the exceedingly heavy rains of last autumn, which were more than equivalent to, and much later than, any ordinary watering. That they should have kept so well, after such a season, is therefore all the more remarkable. The test was a very severe one. In addition to Doradillo, there were two cases of Ohanez, the well known Almeria grape; one from the Rutherglen Viticultural College, borne by vines imported by the writer and planted in 1908, and one from Mr. Grimmond, who has grown this variety for some years under the name of Daria.

The Ohanez opened in really magnificent condition. There was not a bad bunch in the two cases; the few faulty berries requiring removal did not amount to 2 per cent., and these were merely discoloured but quite firm and with no sign of mould.

The Doradillo were, on the whole, in very fair order, though not equal to the Ohanez. Some cases were much sounder than others from the same vineyard. In the best cases, about 5 per cent. of faulty berries required removal, and these were soft and juicy and had to be cut out carefully. In the worst cases, there might be 20 per cent. of waste. Some of the bunches were of large size and very compact, rendering it difficult for the granulated cork to penetrate sufficiently between the berries. Such very large bunches could, with advantage, be broken up into several smaller ones when packing.

The grapes were removed from cool storage and unpacked on Monday, the first day of the Show. On the Saturday, after six days' exposure, they

had scarcely undergone any change in appearance; though an odd mouldy spot was visible on the Doradillos none was noticeable on the Ohanez.

The newly introduced varieties, the keeping power of which was tested as described in the August issue, were again examined. They had been repacked and again placed in the cool chamber on 10th July. Though still in fair order, they were not in fit condition for exhibition, being clammy and unattractive, though few of the berries were unsound.

Repacking is very severe on stored grapes, owing chiefly to the rapid condensation, in the form of dew, of the moisture contained in the warmer, outside air, on the very cold fruit. It is regrettable that the small quantity available did not permit of second experiment with these sorts, some of which are most promising.

TREE PLANTING COMPETITION.

In order to encourage settlers to undertake the systematic planting of trees on their holdings, the Government has decided to offer a number of prizes, from £10 to £60 each, for competition.

Entries must be lodged with the Secretary for Lands not later than the 1st January, 1912, and the prizes will be awarded after the expiration of three years from the following 1st May.

Full particulars will be published in a subsequent issue of the *Journal*.

PAINTED APPLE MOTH.

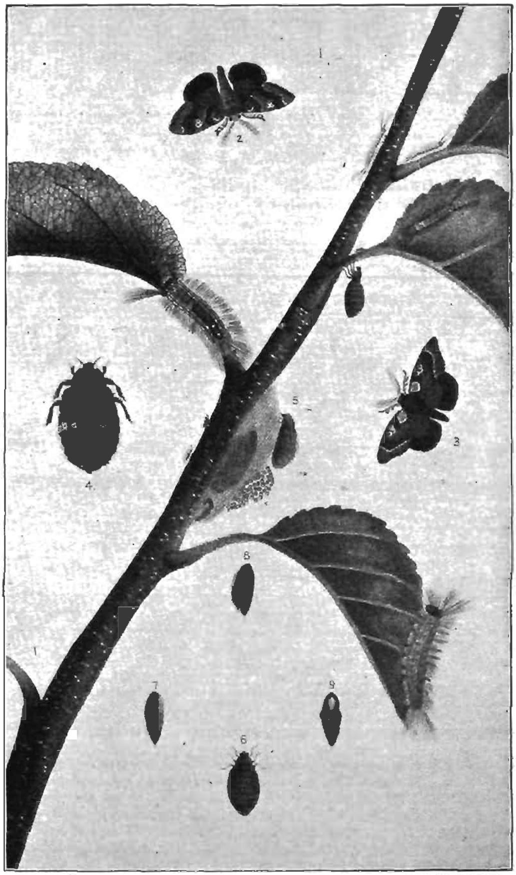
(Teia anartoides, Walker.)

C. French, jun., Acting Government Entomologist.

The painted apple moth, which, in its native habitat, feeds on the leaves of the *Acacia*, especially the feathery-leaved kinds, such as *Acacia Baileyana* (Cootamundra Wattle) and *A. decurrens* (Black Wattle), has been much in evidence during the past few months. In many localities cultivated trees of the species named have been attacked by caterpillars of this moth, with the result that numerous inquiries for the method of treatment recommended by the Department have been received.

Like many other native pests, this insect has also transferred its tastes to fruit trees, such as apples, cherries, and quinces, and also to garden plants, particularly pelargoniums, roses, and chrysanthemums. If prompt action is not taken, the caterpillars eat the young buds; and, as they are voracious feeders, do considerable damage in a very short time. Fortunately, in the arsenate of lead spray, an excellent remedy for the suppression of this pest is available.

The accompanying plate shows the insect in all its stages.



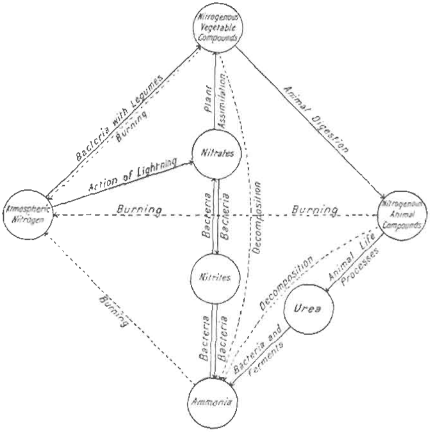
C. C. BRITTLEBANK, DEL. C. FRENCH, DIREXIT.

PAINTED APPLE MOTH.
(*Teia anartoides*, Walker.)

THE NITROGEN CYCLE AS IT AFFECTS AGRICULTURE.

E. S. Holmes, Assistant to Chief Inspector of Farm Produce.

The continued growth of plants and animals is dependent on many conditions, but one of the vital factors governing their development is the provision of nitrogen for their use in such a form as best suits the requirements of the several organisms. The important question of nitrogen supply for the use of growing crops on the farm is one that does not receive sufficient attention by the majority of agriculturists, and it is in this article proposed to endeavour, with the aid of a simple diagram



THE NITROGEN CYCLE.

In the above diagram, the arrows indicate the changes brought about by certain actions, *e.g.*, animal digestion converts nitrogenous vegetable compounds into nitrogenous animal compounds. The dotted arrows indicate the actions which may result in the loss of nitrogen, either as free nitrogen or as ammonia.

illustrating the nitrogen cycle, to indicate the changes which nitrogenous compounds undergo under certain conditions, the natural process by which plants and animals obtain this absolutely necessary element for their growth, the losses which occur, and the best methods of conserving and adding to the nitrogen supplies of the farm.

As is well known, nitrogen constitutes roughly about three-quarters, by volume, of the atmosphere; but, being an inert gas, it does not readily enter into combination with other elements, and conversely, and for the same reason, it is easily liberated from compounds containing it. Hence, the ultimate tendency of nitrogen in combination is for it to be set free

as gaseous nitrogen, in which form it is not readily available to ordinary plants, and animal life.

Now we have the two important facts, that nitrogen is an extremely valuable plant food; and, at the same time, it is easily rendered unavailable so far as its usefulness as food to ordinary plants or animals is concerned. Recognizing both these facts, it becomes a question of no little moment to the farmer as to how he may best prevent the loss of an element in the absence of which his crops will not come to maturity; but, before considering how losses may best be prevented, we must first consider the changes which nitrogen compounds undergo in the nitrogen cycle, and the chief conditions which lead to the loss of this element.

Natural Changes.

On reference to the diagram, we may take, as a starting point, the nitrogenous vegetable compounds, that is, nitrogen contained as compounds in plants. When these are devoured by animals as food, they are converted, by digestion and change in the animal body, into nitrogenous animal compounds. Within the animal organism, continuous building up and breaking down of the tissues of the body is taking place, and in the latter process nitrogen becomes a waste product and is thrown out of the body in the liquid excrement in the form of urea.

This urea is an interesting compound from many points of view, but its chief interest to the farmer centres in the fact that it is very easily converted by certain bacteria and ferments into ammonia, and it is here where a great deal of the loss of nitrogen from farmyard manure occurs. *The marked smell of ammonia noticed in an ill-ventilated stable is due* to the decomposition of urea resulting in the formation of free ammonia, and this ammonia being volatile is practically lost to the farmer as a manure, as it becomes dissipated into the air and so is lost. Certain species of nitrifying bacteria, however, are capable under certain conditions, such as free æration, absence of light and presence of a slightly alkaline medium, of converting ammonia into nitrous acid which forms nitrites with such substances as lime present in the medium in which the bacteria are working.

Hence, if the manure containing the urea is properly looked after and subsequently applied to the soil, the nitrogen in the ammonia formed from the decomposition of the urea is fixed in the form of nitrites. These nitrites are not available to plants as food, but are converted by still other bacteria, working also under a certain set of conditions, into nitrates, and it is in this form that nitrogen is assimilated by plants. It must be remembered, however, that these changes from ammonia to nitrites, and nitrites to nitrates, take place to the fullest extent only under favourable conditions, and if the soil be water-logged, sour, and uncultivated, the reverse actions may be brought about by denitrifying bacteria, and the nitrogen will be lost.

The nitrogen cycle does not of necessity include the stage through the animal kingdom, for nitrogenous vegetable matter decaying in the soil is acted on by the nitrifying bacteria. It is converted into nitrites, and later into nitrates, whence it is again available to plants, and the cycle completed. Another cycle is completed when the nitrogen, set free into the air when vegetable matter is burned, is returned to the vegetable kingdom again by that class of plants known as the legumes, which, acting in symbiosis with certain forms of bacteria, have the power of fixing atmospheric nitrogen for their own use as food.

How Nitrogen is Lost.

As stated above, the burning of vegetable matter leads to the nitrogen contained in it being set free into the air, and the same result takes place from the combustion of animal matter, or when ammonia or its compounds are heated to a high temperature. It is to this practice of burning and the non-conservation of manures that the main loss of nitrogen that takes place on a farm, is due. For instance, when stubble is burned off, timber cleared and burnt, or vegetable or animal refuse destroyed by fire, nitrogen is set free into the air; and, when manures are allowed to lie and rot, or animal or vegetable matter allowed to decompose with free access of air and direct exposure to the weather, the most valuable constituent, *i.e.*, the nitrogen, is lost in the ammonia formed during the decomposition process. It will be easily recognized that the amount of nitrogen dissipated into the air by the above actions is something considerable; and, if it were not for a provision of Nature, our soils would much sooner lose their fertility.

Means whereby Nitrogen may be Regained and Conserved.

It has already been mentioned that Nature has endowed a certain class of plants with the ability to use atmospheric nitrogen for their requirements. It is almost entirely for this reason that the farmer, when he green-manures his land, chooses, wherever practicable, a leguminous (pod-bearing) plant for his purpose. He knows that in this way he has a cheap method of providing necessary food for other crops which have not been endowed with this power of supplying their requirements from the air. Another means whereby atmospheric nitrogen is fixed, is the formation of small quantities of nitric acid during the electric discharges of a thunderstorm. The acid so formed is washed down in the rain and readily becomes available to the plant. It is doubtful, however, whether the above two natural provisions account for the returning into combination of as large a quantity of nitrogen as is set free. In any case, the world at present depends for its supply of easily available nitrates mainly on the deposits in South America; and, for its ammonia supply, on the waste products of coal gas manufacture. The nitrate deposits in Chili must in time run out, and the demand at the present day for nitrates in the manufacture of explosives has put almost a prohibitive price on them as manure for crops, except perhaps where intense culture is carried on.

Many attempts have been made by chemists to fix atmospheric nitrogen for use as manure, and for manufacturing purposes; but, owing to its inert nature, fixation is very difficult, and scientific research has not so far led to the discovery of any cheap process. It would thus appear probable that the world would sooner or later be faced with a nitrogen famine if it were not for the consideration that scientists may be trusted to eventually devise some cheap means for the fixation of atmospheric nitrogen. Already considerable quantities of calcium nitrate and cyanamide are being made artificially by abstraction of the atmospheric nitrogen by means of electricity, and the resultant products have yielded satisfactory returns.

Nature always exacts some penalty for waste, and the agriculturist who wilfully neglects his nitrogen supplies will sooner or later find his land impoverished and himself involved in considerable financial outlay in bringing it back to fertility. His efforts in maintaining fertility should therefore be directed to the growing of leguminous green crops,

either as fodder or as green manure, and to the careful conservation of his bulk manures. Farmyard manure, instead of being allowed to rot in the weather, should be pitted, and a small amount of some material, such as gypsum, added.

Special attention needs to be directed to the liquid excrements, as they are of much greater nitrogen value than the solids; and, if possible, they should be collected in a tank or other receptacle. If they are to be used immediately, dilution with an equal quantity of water is advisable and a little superphosphate may be added, as the urine of grass-eating animals is deficient in phosphates. It is advisable, however, to use some of the liquid excrements along with the solids in the rotting process in the pit. In fact, the whole may be used in this way if sufficient bulk material, such as straw, &c., be present.

In this way, large quantities of valuable manure may be prepared; and, as the value of the addition of farmyard manure to the majority of soils is well recognized, its utilization need not be further advocated here. What needs to be emphasized is the fact that valuable plant food is being continually lost from the majority of farms, mainly through neglect. If the farm is to be carried on as a business proposition, and to be worked in a businesslike way, then the owner will have to do his best to see that these losses are reduced to a minimum.

SPRING MANAGEMENT OF BEES.

F. R. Beuhne, Bee Expert.

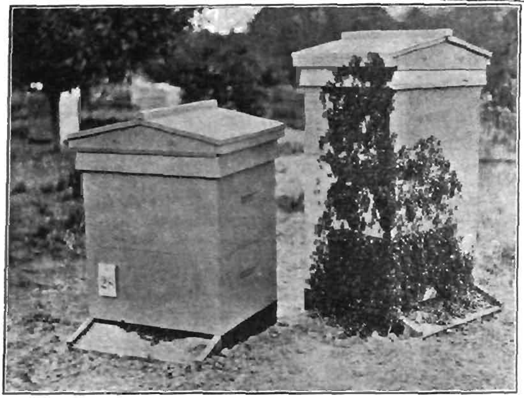
(*Continued from page* 618).

Under normal conditions, a colony of bees increases rapidly in strength during September and October. As soon as all the combs of the brood chamber are occupied by bees, and before they are actually crowded, the second or upper story should be put on and the bees induced to commence work in it. This is done by taking a comb containing honey from the brood chamber and putting it into the second story and directly over the brood combs, while the frame from the upper story is placed into the brood chamber. When a colony of bees has become crowded before the super is put on, it will quite likely be inclined to swarm and no amount of manipulation will cure it of that tendency till the swarming season is over. When bees are worked for extracted honey there is much less swarming than when comb-honey is produced.

If a maximum profit from the number of colonies kept is aimed at, the raising of comb-honey in 1 lb. sections should not be attempted in any locality which has not at least a fair honey flow. Many owners of bees find it very difficult to induce bees to work in the section supers. There are various reasons for this disinclination of the bees to enter sections. Bees at any time prefer to work together in large numbers and without any break in the combs in a vertical direction, and are therefore disinclined to work at comb-building in such comparatively small clusters as the 1lb. sections necessarily create. Further, the sections are, in many instances, supplied with very small starters of foundation, leaving a distance of 3 in. from the brood-combs to the lowest point of the starter in the section. Bees invariably store their honey just above the brood; and,

instead of commencing comb-building on the small starters in the section so far away from the brood and separated from it by empty space and the woodwork of the section, they frequently store the honey they gather into the cells from which young bees emerge. This restricts brood-rearing and causes the crowding of bees in the brood chamber, which is such a fruitful source of excessive swarming.

This difficulty may be overcome by inducing the bees to enter the section, or by compelling them. Bees may be induced to enter the section super by putting on one or more sections already partly built and containing some honey amongst the empty ones in the super. These partly filled sections are known as bait sections. When none are available the bees may be compelled by first putting a super of full sized frames of empty combs, or failing this, of full sheets of foundation on the brood-chamber. If there is sealed honey



SWARM RETURNED AFTER LOSING THE QUEEN.

along the top bar of the brood combs, the cappings of the honey may be lightly scratched with a fork, which will induce the bees to remove it and the queen to deposit eggs therein, thus bringing the brood right up to the top bar. When this stage has been reached, the bees may be brushed off the combs of the upper story and a section super put in its place. As there is now brood in the combs of the hive right up to the top bar of the frames, and as the bees want to place honey above this brood, they will as a rule at once commence work in the section, provided that honey is coming in.

The upper story removed from the hive may be used on another hive for a similar purpose, or as an extracting super. If it contained brood at the time of removal, the largest sheets of it may be put into the brood-chamber. Remove from the latter any combs containing little or no brood, the object being to crowd into the lower story of the section hive as

much brood as possible so as to leave no room for honey. Keep the colony strong, and compel the bees to build comb and store honey in the sections. Any brood left over may be given to weaker colonies, but only as much as can be taken care of by each.

As October is the principal swarming month, a watchful eye should be kept on the hives from 10 a.m. to 3 p.m. on fine days, unless the condition of the colonies in regard to the swarming tendency is known, from a record of the ages of the queens and systematic periodical examinations to see whether swarming preparations are in progress.

While it prevents the absconding of prime or first swarms, the clipping of queens often causes trouble through the queens getting lost. The swarm returns to the hive, only to issue again, a week or so later, with a virgin queen and a greater number of bees. As a virgin queen is light and has greater powers of flight, such swarms will usually settle high up in inaccessible places or abscond without clustering. It is therefore not advisable to clip queens, unless the hives are near a dwelling from which a view of them can be obtained, or the number of colonies is sufficient to keep a special watch on them during swarming hours. The illustration shows a hive to which the swarm has returned after losing the queen.

FARM BLACKSMITHING.

(Continued from page 615.)

George Baxter, Instructor in Blacksmithing, Working Men's College, Melbourne.

IV.—FORGING.

If success is to attend the efforts of those about to start practising at the forge, they must be prepared at the beginning to go slowly. The manufacture of something on which one's fancy is set, may involve, say, welding separate parts together or tempering a tool. As either operation requires a fair amount of practice and no small amount of skill, it had better be left alone until some of the elementary principles, such as managing the fire, noting the effect that heat has upon iron, bending to simple shapes, pointing a bar, and twisting and punching, are thoroughly mastered.

The objects chosen for this article are very necessary ones; and, at the same time, are simple in construction. Welding pieces together is purposely avoided; but, at the same time, a description of how to obtain and judge the welding heat is given, together with the practice of pointing a bar which necessitates a welding heat.

In the article in the September number, several tools were purposely not dealt with, because it was recognized that they might be made suitable exercises for the beginner. They include a *poker* and a *rake* for the fire. The methods of producing these will be taken in the order named.

FORGING A POKER.

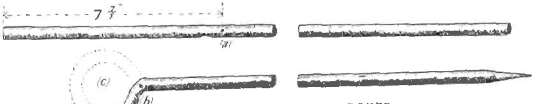
To make the *poker* (No. 27) take a bar of ½-in. diameter iron and cut off a piece 4 ft. long, using the hardee and the hand-hammer.

In cutting cold iron it is not necessary to part it right off with a chisel or hardee. The bar should only be nicked around and then broken off by

striking it over the edge of the anvil. The depth of the cut varies with the thickness of the bar and the quality of the metal; in this case, a nick about $\frac{1}{16}$ in. deep will be adequate.

It will be noticed that sometimes the bars break off easily; whilst, on other occasions, difficulty in separating them is experienced. This is due to the difference in the quality and the temperature of the metal. On examining the fracture of a bar that has broken off easily, it will be observed that a portion, or the whole, of the broken section is crystalline in structure, and bright in colour. On the contrary, when harder to break, the appearance of the fracture is grey in colour and the fibres are distinctly visible. Iron showing the latter class of fracture is the best. Such work as links, hooks, shackles, and bolts, in fact, anything subject to vibration, should never be made from crystallized iron, for the reason that it breaks off suddenly. A great deal might be written concerning the cause of the crystallization of iron, but it would be superfluous in these articles. The farmer simply desires to know how to select the material for his requirements.

Having broken off the piece, the next thing is to bend a circle at one end to form a handle. A convenient size will be 2 in., inside measurement. Previous to doing the practical work it will be necessary to make



27. POKER.

a simple calculation regarding the length requisite for forming the circle. This will be equal to $3\frac{1}{7}$ times the sum of the diameter of the bar and the internal diameter of the circle. Thus, the diameter of the bar being $\frac{1}{2}$ in., and the internal diameter of the circle 2 in., the length will equal $(2 + \frac{1}{2}) \times 3\frac{1}{7} = 7\frac{7}{8}$ in. (nearly). In practice, the nearest sixteenth of an inch is considered sufficiently accurate.

Mark off this length from the end of the bar; and, with the centre punch, mark the position as shown at *a* (Fig. 27). Place in the fire and heat to a bright red, taking care that the part to be bent is uniformly heated. It should then be removed from the fire and bent as shown at *b*. To do this place the centre punch mark level with the furthermost edge of the anvil, and strike with the ball of the hand-hammer about $1\frac{1}{2}$ in. from the centre punch mark; a few blows only will be necessary to bend it to the required shape. The second operation is to place the bent portion on the *beak-horn* of the anvil, and start by hitting on the point of the bar and continuing striking wherever necessary until the correct shape be formed, as shown by dotted lines *c*.

This exercise is a splendid one for the beginner. It teaches him the value of making calculations, and is also excellent training for the eye and hand. It is remarkable how true a person with a practised eye can form a circle on the anvil with no other tool than a hammer. To complete the poker, a point should be made on the other end. This operation appears to the onlooker to be a very simple one, but it requires considerable practice to do it properly, on account of the bar having to be raised

to a welding heat, and quickly hammered. To know when the iron has been raised to the temperature fitting it to be welded is in itself an accomplishment; until one learns how to manipulate the fire and correctly judge the proper heat, it would be almost useless to attempt to do anything, because welding plays such an important part in so many things made by blacksmiths.

Whenever the sectional area of a bar of iron requires to be reduced to any great extent, as in pointing, a welding heat is essential, because if iron be hammered at a lower temperature, with sufficient force to reduce it to a sharp point, separation of the fibres will take place long before the object is attained; in other words, the bar will split. Once splitting commences at the end of the bar, persistent hammering will cause the split fragments to break off, so that failure and disappointment will be the result.

The importance, therefore, of learning how to obtain the welding heat cannot be emphasized too much, for success depends upon it. This knowledge can only be acquired by close observation and assiduous practice. If, in the attempt to forge the point on the end of the poker, the end should split, then the cause can in most cases be attributed to the want of a sufficiently high temperature. Certainly, if after obtaining the welding heat, delay occurs in reaching the anvil, so that the temperature has fallen too low before the hammering begins, the result will be the same as if the welding point had never been reached. If the blows are not struck with sufficient force and rapidity to compress the fibres of the bar, the same thing will happen.

Three important points then to be remembered are:—

The correct degree of temperature must be attained.

On removal from the fire to the anvil, hammering must commence *immediately*.

The blows must be struck quickly and hard enough to be felt throughout the heated mass.

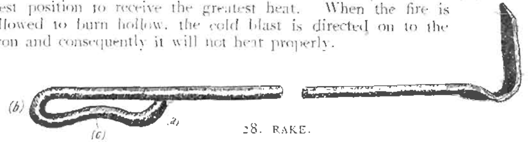
Assuming that these points are recognized, and the end of the poker is heated, it should then be quickly removed to the anvil and held in such a position with one hand, that the end is level with the outer edge of it and the bar is inclined to the face of the anvil, so that the angle formed is slightly greater than the angle of the point required. It is struck one blow directly on the end; then the bar is turned a quarter of a revolution to receive the next blow, and so on, alternately turning and striking. The result is that the point so formed will have a square section. When a round point is desired, first make it square. Then hammer the corners off, striking lighter blows as the operation is nearing completion.

Forging a Wedge.

In making a wedge for a hammer or axe, follow much the same procedure as that described in connexion with the forging of a poker. The wedge is, however, better made from a flat bar. In this case more blows must be struck on the flat side than on the edge, but the first blows should be struck on the edge in such a manner as to narrow the end to about half its former breadth. It is then turned and heavier blows struck on the flat until a sharp edge has been obtained. In making a wedge, a good plan is to barb the edges with a sharp chisel. This prevents the wedge from loosening and falling out as soon as it otherwise would.

Forging a Rake.

By this time the want of a rake for drawing the fire together will have been felt. As the fire burns away it becomes hollow immediately in front and above the tue-iron. This is due to the heat being greater at that part. If the fire is to be maintained in a state of efficiency, the surrounding fuel must be drawn to the centre so as to make a heap in place of a hole. The tue-iron is so arranged that the metal, when lying level with the top of the forge and with the red hot coals heaped above it, is in the best position to receive the greatest heat. When the fire is allowed to burn hollow, the cold blast is directed on to the iron and consequently it will not heat properly.



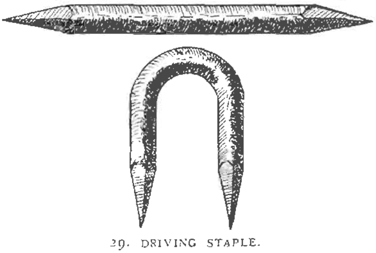
28. RAKE.

The rake illustrated (No. 28) is easily made. Welding has been purposely avoided—a better rake would result if the business end were made from a flat bar and welded on to the handle. One made to the following description will, however, serve the purpose. To make the handle, begin by bending the end as at *a*; then, at a distance of 5 in. from the end, bend to shape *b*, and lastly as shown at *c*. To form the rake end, heat about 5 or 6 in. to a low welding heat and flatten out to about $\frac{3}{16}$ in. thick. The bending to shape is simple; no difficulty should be encountered if the illustration be closely studied.

Forging Staples.

Two kinds of staples are used: one, pointed at each end, is for driving into timber, whilst the other is for screwing on to a door or a box lid. Nos. 29 and 30 show the difference in design.

The *driving staple* (No. 29) is made by pointing each end of the piece of iron and afterwards bending to a semi-circular shape at the centre. The most difficult part is to get both sides the same length.

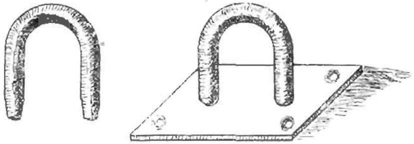


29. DRIVING STAPLE.

To make the *box staple* (No. 30) the bow is bent as in the previous case, but the ends are not pointed by hammering; they are filed slightly tapered as shown. If a $\frac{1}{4}$-in. staple be required the ends should be tapered to $\frac{3}{16}$ in. at the ends. A piece of sheet iron, about $\frac{1}{8}$ in. thick by

$1\frac{1}{4}$ in. wide by 2 in long, should be cut out; or, if there be no sheet iron available, a piece may be flattened out from a bar of small flat iron or mild steel.

The two holes for receiving the ends of the staple should be drilled, or may be punched with the hand punch. The size of hole requires to be slightly less than $\frac{1}{4}$ in. diameter. The bow is then gripped in the vice, allowing about $\frac{3}{8}$ in. to stand above the top of the jaws. The plate is



30. BOX STAPLE.

then driven tightly on to the ends until about $\frac{1}{8}$ in. stands through the plate. The ends are now rivetted down which prevents them from being drawn out. All that remains to be done is to drill four small holes about $\frac{1}{8}$ in. diameter at each corner of the plate and counter-sink them with a larger drill to suit the head of the screws.

(To be continued.)

CLOSER SETTLEMENT STUDIES.

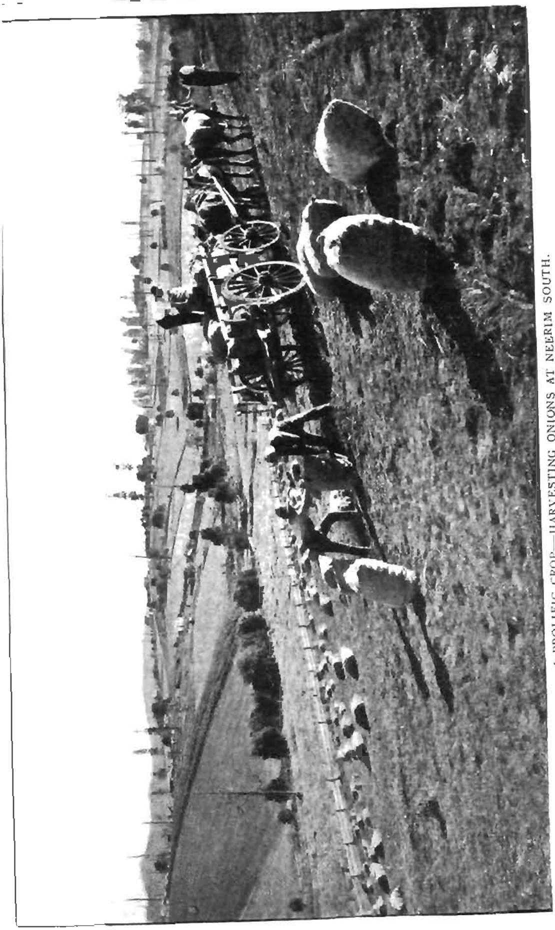
J. S. McFadzean, Senior Dairy Supervisor.

ONIONS IN SOUTH GIPPSLAND.

The splendid quality of much of the land in South Gippsland would justify far closer settlement of that district than at present exists. Thousands of acres there are still covered with scrub, while over large areas the only advancement that has been made towards improving its natural producing capacity is that of ringing the heavy timber and burning the undergrowth. Following on this work good grazing for stock is obtained; and more especially where the natural pasture grasses have been replaced by sowing some of the stronger growing English grasses, such as perennial rye, cocksfoot, and the clovers. On the lower slopes of the hills and on the more level country there is much first class farming land that might be put to more profitable use than grazing; for under the plough it would be as productive, and consequently become as valuable, as that in any other part of the State.

All along the railway lines evidence of the fertility of this country may frequently be seen in the heavy crops that are harvested from small areas. In connexion with the various farm competitions held by agricultural societies many fine crops of maize, mangolds, turnips, &c., have previously been reported in this *Journal*. A photograph reproduced here conveys some idea of a crop of onions that was grown this year close to the Neerim South railway station.

The soil there is the deep brown or reddish coloured volcanic loam so frequently met with throughout Gippsland. Similar land adjoining it is



A PROLIFIC CROP—HARVESTING ONIONS AT NEERIM SOUTH.

in the rough-cleared state previously referred to; and is being used for grazing dairy stock. This paddock of 4¾ acres was also in grass until 2 years ago; since then, Messrs. Foster Bros., working on shares with the owner, Mr. J. Greenaway, have taken two crops of onions off it without using any fertilizer.

The crop just harvested was a remarkably fine one: the bulbs being of good uniform size and evenly matured. From the 4¾ acres, 1,100 bags of first class onions were forwarded to Melbourne, and a few more bags were sold locally. This amounts to approximately a 20-ton per acre crop. In several places on the Southern line, large piles of bagged onions are to be seen on similar small areas awaiting transport; showing that this crop is becoming popular throughout the district.

Much difference of opinion exists in regard to the marketing of this crop in the early part of some seasons when prices are low. At such times, the feeling generally is that it pays to hold the onions till later in the year when prices improve. Discussing this matter once with a grower of long experience, he mentioned that he always marketed his crop as soon as it was ready, irrespective of price. In the market one day he was taken to task over this by several of his neighbours, who considered he frequently lost money by selling in a cheap market. He replied by challenging them to show that they made more per acre out of their onions than he did; and, when the account-sales were compared, he was on the right side.

He supported his system of marketing from many points. Being only a small farmer, ready money was an item for consideration with him. Also, no matter how good a crop might be when first bagged, there would always be some to throw out if they were held over for any time; and the loss from such rejects was at times considerable. The cost of picking over and re-bagging stored onions was also an important item. Again, if the season were favourable and the onions kept well, the expected rise in price more than probably would not follow. Altogether, he showed that a quick sale at current prices for all he grew gave a better cash return per acre than his neighbours obtained by taking chances on market fluctuations.

The aspect is the same in dealing with almost any crop on a small scale. If it can be sold straight off when harvested the cost of handling is at the minimum, and no chances are taken on loss through deterioration. The man with capital behind him may possibly afford to gamble a little with his produce; but, almost invariably, the small grower will come out best on the immediate sale system.

PUMPKINS AND DAIRYING.

About a mile from the Toora station, the railway line passes through the farm of Mr. R. H. Downing. This property is worked as a dairy farm on the share system by Mr. Chas. Lousada and family; milking an average of 65 cows the year through. The cream is sent to the Foster butter factory; and the skim milk is used in raising and fattening the progeny of 9 brood sows. Hay and maize are grown for the dairy herd; and the silo is made use of in conserving surplus fodder for winter use. Potatoes, peas, and pumpkins are grown to provide the bulk of the solid food for the pigs.

The pumpkin crop this year on this farm was a particularly fine one. From two average sections of the 1½-acre paddock, a total of 444 sq. yards was measured off, and the pumpkins thereon were counted. On this

area, there were 169 pumpkins averaging about 50 lbs. each. There were very few small ones, and one of the largest weighed 130 lbs. This rough estimate of the crop gave over 40 tons of pumpkins per acre.

These are put through a pulper; and the 50 pigs on hand consume about 600 lbs. weight of them daily. The variety sown looked like a cross between the Ironbark and Mammoth varieties; and heavy crops have been grown from the same sample of seed on other farms.

As a useful fodder for both pigs and cows pumpkins might be much more generally grown. They occupy the ground for only a few months in the year; they do not require much attention; they are easy to harvest; they keep well; and they can usually be depended on to give a heavy yield per acre.

TO START FARMING.

I.—HINTS FOR NEW SETTLERS.

T. A. J. Smith, Chief Field Officer.

There is a considerable choice for the new settler in Victoria as to different forms of farming in various parts of the State, owing to the great variety of climate and soils, both in irrigable and non-irrigable areas. As to which class of farming will suit him best and the amount of land he can work to the greatest advantage, a good deal will depend in the amount of capital at the disposal of the settler; and the labour he commands in his family. It has been proved in many cases, and in many places, that men with small capital can make remarkable progress in this State, provided they are thrifty and energetic and are possessed of average ability. For the guidance of all classes of men, both new comers and others who wish to start on the land, it is proposed in this article to deal with the general conditions under which farming, in its various phases, is conducted in different parts of Victoria.

To the man with little or no capital, and no family, the best advice that can be suggested is that he obtain employment under a good farmer in a good district until he has saved sufficient to start with a block of land on his own account; in this way, a prospective settler from oversea will get valuable experience as to local conditions, as well as save money if he is thrifty. A useful farm hand can get full employment at from 15s. to 25s. per week and his board and bed. In five years he may save sufficient to start on the share system, or on a small piece of land of his own, with a good general idea as to the manner in which land should be worked to the best advantage.

When a man has a family of boys and girls of from 14 years of age upwards he can, with very little capital, if he has had previous experience on the land, get a farm on the share system—either dairying or wheat-growing—and make from £100 to £300 per annum, according to the scale on which he conducts operations and the ability he displays as a manager. There are other forms of farming on the share system, such as the growing of fruit, tobacco, and broom corn, but all these require greater experience than the two first mentioned, being more in the nature of intense culture. Where the new comer feels specially inclined to take up any of the three latter pursuits he will find it wisest to spend a year or

more with some successful man, in acquiring the necessary knowledge for success in these industries. A useful man can always obtain good wages during the time so spent.

In the North-Eastern and Gippsland districts the native timber is highly suitable for building purposes. The young trees, locally known as saplings, grow straight and tall, the bark is easily removed, and they are easily worked and are durable under cover. There is also much good timber for fencing use, the best to stand in the ground being red gum, box, and stringy bark. Fencing posts can be bought from 30s. to 70s. per hundred, according to the district in which they are required. The varieties mentioned also make fine fuel, the timber generally being good in this respect throughout the State.

The following list of well established farming industries gives a fair variety from which to make a selection:—

1. Dairying combined with pigs, fowls, hay, tobacco, broom corn, sugar beet, fruit, or potatoes.
2. Wheat-growing, with or without sheep.
3. Fruit, including citrus fruits, apples and stone fruits.
4. Market gardening if near a large centre, and small fruits.
5. Lucerne-growing and lamb-raising.
6. Tobacco, broom corn, maize, flax, beans, onions, or other intense crops.
7. Viticulture.

Dairying.—There are many districts in Victoria suited for this occupation. The Western District is famous for dairying, but the price of land is high for the small capitalist; dairying on shares, however, is practised on an extended scale; or land can be rented, and there are many instances on record of tenants starting either on shares or rented land, who have become owners of valuable farms as a result of their thrift and energy.

Eastern Gippsland and Southern Gippsland are also good dairying portions of the State. On practically all the northern irrigated areas where lucerne can be successfully grown, dairying can be profitably carried on, especially in conjunction with the establishment of a fruit farm. In the North-Eastern District, the upper valleys of the Murray, Mitta, Kiewa, Ovens, King, Broken, and Goulburn rivers, and their tributaries, are all well suited for dairying: and though not in the irrigation areas command sufficient water for irrigation from private pumping plants.

Hay-growing.—Hay can be grown practically all over the State, the cooler districts producing the best quality.

For Wheat-growing, the Northern, North-Western, and North-Eastern (West of the Sydney line), Wimmera, and Mallee are all suitable. Land in the Wimmera of late years has increased in value enormously owing to its suitability for both wheat and sheep production. Share farming is, however, carried on by some farmers which would enable the small capitalist to obtain a footing. In the Goulburn Valley, Northern, and North-Eastern districts, the same applies.

The Mallee possibly is at present the best opening, as areas are still available for selection on easy terms. Particulars can be obtained on application to the Lands Department. The rainfall is somewhat uncertain, and though the past six years have been favourable the possibility of a drought in that area must be considered. Fairly large holdings are necessary, say not less than 600 acres, in order to allow the system of

fallowing to be adopted. Fallowing is necessary; and, on a block of 600 acres or over, the object should be to have one-third under fallow, one-third under cultivation, and one-third under grass for sheep each year. The cost of clearing is from 15s. to 30s. per acre, the scrub being cut, rolled, and burnt.

When farmed on a fairly large scale, wheat can be grown in Victoria for from 1s. 4d. to 1s. 6d. per bushel and returns range up to 4s. 6d. per bushel. Of late years, the price has been good, and a great deal of money has been made by wheat-growers. Prospects in regard to prices are still promising; the world's supply is not increasing in proportion to the demand. The average yield for the past season was over 14 bushels per acre. The fear of over-production need not deter intending wheat-growers, as the total production of Australasia is only about 2½ per cent. of the world's wheat, or 12½ per cent. of the production of the British Empire.

The cost of cleared wheat land varies very considerably. In remote districts, it can be bought from £3 10s. upwards, and reaches £12 in those districts well proved as regards soil conditions, and more favoured as regards rainfall.

FRUIT, according to the suitability of climate and soil, can be grown over the greater part of the State. The colder portions are most sought after for apples, pears, plums, and currants; and, as comparatively poor land will produce these varieties, the price is low per acre. Established orchards may be bought at from £20 to £60 per acre. For citrus fruits, the sandy soils in irrigated areas are the most suitable, and very fine profits are obtained. These fruits, also apricots and peaches, do best in the warmer districts. It should always be remembered that it takes from four to seven years to establish an orchard or citrus grove, and until that period has passed large returns cannot be expected. The same remark applies to vine culture.

The cost of planting an orchard and the care of it, until returns come in, is approximately £25 to £30 per acre. In the majority of cases, it is best to build up the plantation by degrees.

MARKET GARDENING, in conjunction with other systems of farming such as dairying, potato-growing, &c., will pay well where conducted near a city, or some of the larger country towns. Land for this purpose can be secured at prices ranging from £10 to £25, according to quality and locality. Within 12 miles of Melbourne, there is plenty of available land of a sandy nature that is suitable for such purposes.

TOBACCO-GROWING.—With regard to tobacco, the beginner had better gain experience on the share system with an experienced grower. There are plenty of opportunities of obtaining land under this system; or, if desired, land can be rented. An area of 5 acres is sufficient for one man to attempt to cultivate, the labour involved being constant for seven months of the year. Returns from £20 to £60 per acre are possible.

The North-Eastern portion of the State at present produces the greater portion of the tobacco grown, principally on the Ovens and King Rivers. But many other parts of Victoria will produce tobacco successfully, such as Eastern Gippsland, and some of the irrigation settlements. This is a crop that lends itself to mixed farming well. Often it is a successful adjunct to dairying, the acreage required being small and consequently not interfering with the grazing capacity of the farm unduly.

BROOM CORN is also profitably grown in the King and Ovens River Valleys in conjunction with dairying, and gives a return for broom fibre

of from £5 to £8 per acre. The seed is useful as feed for horses, cows, pigs and fowls; and the cane can be made into silage, after the fibre and seed are removed. The crop will thrive on any rich river flats where the rainfall is good.

MAIZE for grain will grow well on the rich flats of Gippsland and the river flats in the North-East, wherever the rainfall is good or irrigation is possible. Crops of 70 to 100 bushels are taken off the land at Buchan and Orbost, and the rental value of the land is from £3 to £4 10s. per acre. The cost of production is about 2s. per bushel, including rent for land. Prices range up to 5s. per bushel, the market value generally leaving a nice return over and above the cost of production.

POTATOES, BEANS, and ONIONS are grown largely in Gippsland and all these crops combine well in mixed farming. Potatoes are grown successfully in many other parts of the State, notably in the Warrnambool, Bungaree, and North-Eastern districts. The average yield is about 3 tons per acre, and prices vary from £2 to £6. Many farmers devote themselves wholly to this crop and make money. The cost of potato land ranges from £5 to £60 per acre. Onions are grown in the Western District and Southern Gippsland, and land can be rented for their growth at from £1 to £3 per acre. Both potatoes and onions are risky crops as compared with others, in that they are subject to pests and great fluctuation in market prices and, as they can not be kept from one year to another, must be sold at whatever price they will command.

LUCERNE-GROWING, either for dairying or lamb-raising, is better suited to the irrigation areas, on those soils which contain a fair percentage of lime. The Goulburn Valley promises to produce large crops of lucerne, as also do the settlements near Rochester, Swan Hill, and Wyuna; in fact, all the free soils in which lime is present and where water is available are suitable for lucerne.

The LAMB-RAISING industry is not yet developed on small farms in Victoria to any extent, and the profits are not as large as those from dairying. Its suitability for larger holdings, especially when combined with wheat-growing, is beyond question.

VITICULTURE is a paying industry, but requires special knowledge for successful working; and, like fruit, takes time to develop. It is suited to many soils and climates, but in the drier districts water for irrigation is necessary. Returns of from £25 to £50 per acre, and sometimes higher, are made in the Mildura and Rutherglen districts; in the former, chiefly from raisins and currants, and in the latter, from wine. A considerable amount of capital is required to start on these lines and unless money is available they should be commenced on a small scale in conjunction with other pursuits. The cost of establishing a plot of vines is from £25 to £30 per acre, exclusive of the value of the land.

LAND PURCHASE.

CROWN LANDS.—Land can be selected in many parts of Victoria under varying conditions. As full particulars are obtainable from the Lands Department only brief information is given here.

First class land can be selected at 20s. per acre, payable over 20 years in equal instalments. A licence is issued for the first six years, during which period 20s. per acre in improvements must be effected; at the end of six years, a lease is given and at any time during the fourteen years for which the lease is held the Crown grant can be obtained on payment of the amount due to complete the 20s. per acre.

Second class land can be obtained under the same system at 15s. per acre, and third class land at 10s. per acre.

Land can also be taken up under lease with a view to selection later on.

LANDS PURCHASE AND MANAGEMENT BOARD.—Under the provisions of the Closer Settlement Acts the Board will sell land to settlers on a small deposit and allow 31½ years for the payment of the purchase money in half-yearly instalments. The deposit is credited as part of the principal, and the balance bears interest at 4½ per cent.

PRIVATE LAND.—Land can be bought privately all over the State on payment of a deposit, which varies from 10 per cent. to 30 per cent. of the whole value, the balance being obtainable by mortgage at about 4½ per cent. on good landed security.

Land can be rented for grazing purposes at from 5s. per acre up to 20s. per acre and for cultivation from 10s. to 90s. per acre.

CREDIT FONCIER SYSTEM.—The Government Savings Banks Commissioners advance money on long terms (31½ years) on good security. Repayments are made half-yearly at the rate of 6 per cent. per annum. This includes 1½ per cent. towards sinking fund, so that at the end of the period the whole debt is paid off.

EQUIPMENT AND PROFITS.

The subsequent details will give the intending settler some idea as to the equipment required for the different systems of farming, together with the returns that should be reasonably expected; these of course will fluctuate more or less under different conditions. In estimating the requirements, a house and outbuildings and fencing are included, while in some cases these may be in existence on the farms. The value of the land is not included in the estimate, but simply the cost of buildings, fencing, stocking, machinery and other requirements in order to give some idea of the capital necessary. A handy man who could assist in the building and other improvements would naturally save some of the outlay.

Capital required to start on a 50-acre Farm and Returns that might be expected.

EXPENDITURE.	£	s.	d.
W.B. house (4 rooms and furniture) ...	120	0	0
Outbuildings (stable, 2 stalls, £10; separator room, £10; milking and machinery shed, £15; fowl house, £5) ...	40	0	0
Implements (plough, £2 15s.; harrows, £5; scuffler, £2 5s.; swingle-bars, 12s. 6d.; cart (secondhand), £10) ...	20	12	6
Separator ...	26	0	0
2 horses—one medium, one light draught, at £30; harness, £5 ...	65	0	0
15 cows, at £7 10s. each ...	112	10	0
3 pigs, at 15s. each ...	2	5	0
Seed, manure, and sundry tools ...	20	0	0
Total ...	406	7	0

RETURNS FOR TWELVE MONTHS.	£	s.	d.
15 cows for milk and cream, at £10 each ...	150	0	0
12 calves, at 12s. each ...	7	4	0
5 acres of potatoes, 20 tons, at £3 net; or 3 acres of tobacco; or 10 acres of broom corn, flax, beans, or onions ...	60	0	0
12 pigs, net profit, at 30s. each ...	18	0	0
	235	4	0

A married couple would be able to do all the work required to produce this return. Extra labour must be allowed for, in estimating the returns from potatoes, tobacco, &c. The plant is of course, primitive, and should be added to by degrees, the bare necessaries being allowed to start with. The returns from the cows are above the average for Victoria, but a small herd, carefully selected and well looked after, should be made to give these figures.

One of the greatest advantages in starting farming as a dairyman is the quick return, which should be monthly, from the cows; from crops, eight to twelve months would elapse before a return was obtainable. No allowance has been made for the purchase of a bull; as, if the services of a neighbour's bull can be obtained for a small herd, an extra cow can be kept, and his purchase and keep saved. In the irrigation districts Government bulls are placed for public service at a small fee. The pigs should be turned off as fats every three months or two brood sows kept and their progeny sold as slips. Allowing £15 per annum for losses and depreciation, the net annual income should be £220, the capital required being £400, including house and buildings, or £240 if these are already on the farm.

Capital required to start on a 100-acre Farm, and Returns that might be expected.

On a 100-acre farm, the cost of equipment would be larger, but at the same time less in proportion to the return. The same house, with slightly larger out-buildings and more expensive machinery, one more horse and fifteen more cows would cost as follows:—

EXPENDITURE.

	£	s.	d.
House, 4 rooms	120	0	0
Stable (3 stalls), £15; milking shed (12 bails), £30; separator house, £10; fowl house, £5	60	0	0
Plough, D.F., £15; harrows, £6 10s.; scuffler, £2 5s.; bars, 15s; harness, £12; separator (60 gallon), £26; cart, £15 (secondhand)	77	10	0
30 cows, at £7 10s. each	225	0	0
3 horses, at £30 each	90	0	0
6 pigs, at 15s. each	4	10	0
Seed, £15; manures, £15; tools, £10	40	0	0
	617	0	0

RECEIPTS.

	£	s.	d.
30 cows, yielding £10 each	300	0	0
25 calves, at 12s. 6d. each	15	12	6
24 pigs, at 30s. each	36	0	0
5 acres of potatoes, or 3 acres of tobacco; 10 acres of broom corn or other crop	60	0	0
	411	12	6

A family of five could comfortably work a farm of these dimensions, which, after allowing £21 for deterioration, loss, &c., would return £390. In both cases, where the property is bought, payments for interest and sinking fund would be an annual charge. On irrigated land, shire and water rates, insurance, and other charges would also have to be paid.

Seasons must be reckoned with, and the good dairyman will always have a stack of hay in reserve; and, as soon as possible, a silo which will

cost about £40 for one of 60 tons capacity. Plenty of green fodder, consisting of maize and millets for summer feed, and barley, rye and oats for winter feed will be found the safest; clovers and lucerne will do well for permanent pasture, with rye grass, cocksfoot and others for a change.

Good clean water for stock is essential and some shelter trees will save feed and add to the profits.

Jersey, Ayrshire, Shorthorn and crossbred cattle of good milking strains can be bought in Victoria; and, in pigs, Berkshires, Yorkshires, and Tamworths of good strains are obtainable. To the man who will work and use forethought and common sense there is a fine prospect of success.

Wheat Farming on Shares.

The terms of wheat farming on shares vary according to the conditions under which it is conducted.

In some cases, the owner of the land supplies horses and implements as well as the land, cleared and fenced, and meets half the cost of manure, seed, and bags, the tenant finding the other half and providing labour. In such cases the land-owner reserves the right to graze off the crops, and to use the fallow land when no crops are being grown. The crop is equally divided when harvested. These are somewhat unusually good terms, but can be obtained in some cases. A more common agreement is for the tenant or share-farmer to find horses, harness, and implements, half the cost of manure, seed and bags, and the labour, the land-owner providing the land, fenced and cleared, and half the manure, seed, and bags. Each takes half the crop as his reward in the enterprise. Another system, in more remote places, is for the land-owner to provide the land only, and the share-farmer to find labour, horses, machinery, manure, seed, and bags, the land-owner receiving one bag per acre: the share-farmer takes the balance.

The cost of a team of six horses will be, at £35 per head, £210; a harvester will cost £80; harrows, £6 15s.; binder, £38; 4-furrow plough, from £35 to £45, according to kind; drill, from £25 to £45; a waggon capable of carrying 5 tons, from £45 to £60; harness for six horses, £40.

The machinery can be purchased secondhand in many cases at about half the values given; but, unless the buyer understands machinery well, it is safer to buy new implements, for which good terms are given by the vendors. Care should be also exercised in choosing implements suited to the different districts and conditions under which the farming operations are conducted; for instance, set ploughs are not used in Mallee country, but only stump-jump implements until the land is cleared of stumps, a period covering eight to ten years. Disc ploughs are much in favour with many farmers in the Northern areas, owing to the fact that they will plough land when mouldboard ploughs cannot enter the soil.

General Advice.

The conditions governing farming pursuits are so entirely different in Victoria to those in Great Britain that a few words of advice as to the main points may be of use. In the first place, the climate of Victoria in the chief wheat areas is warm and dry as compared with the Old Country; the bulk of the wheat is produced with a rainfall of from 9 to 26

inches. The average yield last year was $14\frac{1}{2}$ bushels; and, though this average is only half that obtained in England, large amounts of money are made here out of wheat-growing. In the main wheat centres, a farm of less than 500 acres is looked upon as small, and it is the area under cultivation that each individual has, that assists in making the large returns. With very little assistance, one man can put in and take off 200 to 250 acres of wheat with a team of six or eight good horses and the machinery suitable for the purpose. The machinery will be found very different to that used in Britain; the ploughs here are multi-furrowed and capable of turning over large quantities of ground in a day. The surface-working implements, such as discs, skim ploughs, and harrows, are made specially for working land on a large scale and saving labour as much as possible. Perhaps the most important operation connected with wheat farming is working the land for the conservation of moisture, and fallowing is a general practice to this end.

Fallowing to *dry out or clear land* is only done in those districts with a heavy rainfall.

The use of artificial fertilizers is general, the most popular being superphosphate, bonedust, and Thomas phosphate. The first named gives good results on soils containing lime, the bonedust on sandy loams, and the Thomas phosphate on the heavy wet clays. Other artificial fertilizers are used in dairying and market gardening operations, and, owing to the scarcity of farmyard manure, through lack of winter housing of stock, will come more into favour in the future.

Labour is one great difficulty and is hard to obtain in all pursuits, even at high wages; consequently, the settler would be wise to go slow at first and not depend too much on labour outside his own family.

Distances from markets will at first appear a drawback, but that condition will soon become accustomed to and not feared. Teams of twenty bullocks or eight to ten horses are common and loads of wheat and other produce often amount to 5 or 10 tons.

Stock generally are easily catered for, and stall feeding, except under certain conditions, is not a general practice. The natural grasses, supplemented with hay feeding, and the genial climate, render stall feeding unnecessary.

Horses for farm work can be bought for from £25 to £60 each, according to quality; dairy cows from £5 to £12 each; pigs from 8s. for suckers to 30s. for slips. Farm machinery of all kinds (including harvesters, strippers, binders) is manufactured in Victoria and sold on easy terms, in some cases extended payments over three years being allowed. The two former harvesting machines are well suited to Victoria under the prevailing climatic conditions.

There are well established nurseries for fruit trees of all descriptions. There is a good opening for pure seed farms, where seed that can be relied upon for being true to type, and clean, could be produced, and many farmers would be pleased to pay 25 per cent. to 30 per cent. higher rates than those obtained under ordinary market conditions for guaranteed seed.

The Department of Agriculture has a staff of specially qualified men whose duty it is to give information to any one applying for instruction in fruit-growing, wheat-growing, dairying, tobacco and potato-growing, viticulture, stock, manures, &c.

VICTORIAN EGG-LAYING COMPETITION, 1911-12.

CONDUCTED AT BURNLEY HORTICULTURAL SCHOOL

(Continued from page 653.)

H. V. Hawkins, Poultry Expert.

No. of Pen.	Breed.	Name of Owner.	Eggs Laid during Competition. April to July.	August.	Total to Date (5 months).	Position in Competition.
12	White Leghorn	W. G. Swift	479	136	615	1
40	,,	A. J. Cosh (S.A.)	470	142	612	2
31	,,	R. W. Pope	450	138	588	3
33	,,	Range Poultry Farm (Qld.)	403	128	531	4
18	,,	S. Brundrett	386	120	506	5
20	,,	H. McKenzie	363	142	505	6
37	,,	E. Waldon	369	136	505	
13	Black Orpington	D. Fisher	348	137	485	8
46	*Black Minorca*	G. W. *Chalmers*	313	139	452	9
32	Silver Wyandotte	M. A. Jones	318	126	444	10
63	Black Orpington	A. J. Treacy	310	129	439	11
66	White Wyandotte	J. E. Bradley	309	120	429	12
44	Black Orpington	T. S. Goodisson	300	128	428	13
21	White Leghorn	K. L. Appleford	317	108	425	14
25	,,	B. Mitchell	301	120	421	15
55	,,	W. G. McLister	283	129	412	16
51	,,	J. W. McArthur	288	118	406	17
39	,,	A. W. Hall	274	132	406	
10	Black Orpington	H. A. Langdon	263	139	402	19
67	White Leghorn	C. L. Sharman	266	131	397	20
9	,,	J. *O'Loughlin*	264	126	390	21
36	,,	F. A. Sillitoe	284	106	390	
1	,,	A. Brebner	273	107	380	23
24	,,	F. Hannaford	258	121	379	24
38	,,	Mrs. C. K. Smee	238	137	375	25
22	Black Orpington	P. S. Wood	248	123	371	26
19	White Leghorn	A. Jaques	248	123	371	
4	*Golden Wyandotte*	*H. Bell*	233	137	370	28
3	White Leghorn	K. Gleghorn	231	130	361	29
58	Faverolles	K. Courtnay	225	131	356	30
42	*White Orpington*	*P. Mitchell*	225	130	355	31
5	White Leghorn	L. C. Payne	239	110	349	32
8	,,	T. W. Coto	229	114	343	33
27	,,	Hill and Luckman	225	116	341	34
28	,,	J. Campbell	198	141	339	35
50	,,	C. H. Busst	214	124	338	36
54	,,	F. N. Hodges	223	115	338	
65	,,	H. Hammill (N.S.W.)	222	111	333	38
41	,,	Morgan and Watson	221	112	333	
49	,,	W. J. Thornton	197	127	324	40
47	,,	C. W. Spencer (N.S.W.)	207	111	318	41
2	,,	E. P. Nash	257	61	318	
45	,,	T. Kempster	187	128	315	43
60	,,	J. J. Harrington	181	133	314	44
59	,,	W. H. Dunlop	177	131	308	45
43	,,	W. B. Crellin	179	125	304	46
11	Brown Leghorn	F. Soucum	164	122	286	47
53	White Leghorn	A. Stringer	152	132	284	48
23	Golden Wyandotte	G. E. Brown	165	117	282	49
30	*Black Orpington*	*Rodgers Bros.*	156	126	282	
62	White Leghorn	P. Hodson	154	124	278	51
52	,,	W. J. McKeddie	135	139	274	52
57	,,	*G. E. Edwards*	137	134	271	53
16	Silver Wyandotte	Miss A. Cottam	147	120	267	54
6	,,	Mrs. H. J. Richards	135	132	267	
26	White Leghorn	F. Seymour	159	93	252	56
34	,,	E. Dettman	145	106	251	57
7	,,	H. Stevenson	130	103	233	58
61	Silver Wyandotte	J. Reade	109	123	232	59
35	White Leghorn	J. H. Brain	91	117	208	60
14	Black Orpington	W. J. Macauley	82	120	202	61
17	White Leghorn	W. J. Eckershall	86	109	195	62
56	,,	Mrs. C. Thompson	78	112	190	63
64	,,	J. D. Read	44	127	171	64
15	Minorca	H. R. McChesney	44	81	125	65
48	,,	G. James	15	68	83	66
			15,021	8,033	23,054	

CHEDDAR CHEESE-MAKING.

G. C. Sawers, Cheese Expert.

Cheddar cheese is the most popular cheese with English-speaking people. Its name is derived from a small village of that name in Somerset, England. In that district, this cheese was made over 300 years ago. The system gradually spread to the principal British colonies. In the United States, in 1830, cheese was sold in the local markets at 2½d. to 4d. per lb. From 1840 to 1850, the Americans began to ship it to Britain. In 1851, the factory system was inaugurated; and by 1866, 500 factories had been built. For the season ended September, 1859, 7,542 tons were exported. From that date the exports increased rapidly, and for a long time the Americans had the British market almost to themselves. Canada then entered into the business.

The original system was somewhat complicated, and it required a large amount of experience to produce a cheese of good quality. Even then troubles that puzzled the most experienced makers would affect the quality. The Canadian experts developed a modification of the system under which, by following fixed rules, more certain results are obtained and a more uniformly good article is produced. This is now known as the Canadian Cheddar system; and by it makers of limited knowledge are enabled to achieve greater success than was formerly possible by the most experienced under the American or "Stirred curd" system. The Canadian cheese trade soon grew to one of great proportions, and the quality was such that it commanded the highest prices. Owing to the rapid increase of population in the United States, the exports from that country have decreased till they have now little influence on the trade.

The system was introduced into New Zealand, but for many years the export trade was at a standstill, while the butter exports forged ahead. In 1907, however, owing to various reasons, the demand for cheese increased and uniformly good prices were obtainable. As the following figures show, the New Zealand cheese export trade has steadily developed:—

NEW ZEALAND CHEESE EXPORTS

	£
1905	180,874.
1906	265,084.
1907	449,676.
1908	792,318.
1909	865,456.
1910	1,185,704.
1911	1,222,364.

The Canadian system was introduced into Victoria by the late Mr. David Wilson about 1892, when at several factories the necessary plant was installed. A small quantity was exported and satisfactory prices obtained, up to 56s. per cwt.; but it was not persevered with. Last season, again, a small quantity was exported with very encouraging results, over 61s. per cwt. being realized for some makes. The quality was very favourably commented upon by the experts in the trade in England, which shows that the country and climate are thoroughly suitable for the industry. A large expansion in this branch of the dairying industry should therefore occur in the near future.

Cheese as an Article of Diet.

Cheese is highly nourishing, and is one of the staple articles of food of the masses in Great Britain, where the imports amount to over £6,000,000 annually.

Cheddar cheese, when properly made from sound milk of average composition, is of rich quality, perfect solidity, mellow or plastic, and of specially mild and pleasing flavour, reminding one of a ripe hazel nut. It will keep under proper conditions, and with continual improvement, from one to two years; or it may be consumed when three to four months old, and at the latter age is more digestible than most other makes of cheese.

The average analysis of matured cheddar cheese is as follows:—

	Per cent.
Water	30.32
Fat	35.53
Casein	28.18
Salt, Ash, &c.	5.07
	100.00

Or roughly, about one-third fat, water, and casein respectively.

Although due, to some extent, to the butter fat which it contains, the peculiar mellow appearance and texture of choice cheddar are more largely the result of the breaking down which the casein or curd undergoes during ripening. The curd is hard and insoluble in water when first made, but by degrees it becomes softer and more soluble; or, to speak more correctly, gives rise, by the processes of fermentation, to products which are soluble in water. If cheese is consumed before this ripening process has developed, it is neither so wholesome nor nutritious as when properly ripened. The proper ripening of the cheese depends principally on the manufacturing process and the subsequent treatment of it while ripening.

Milk.

Milk is a very complex substance and is a perfect food. It will be sufficient to note its principal contents, which are as follow:—

	Per cent.
Water	87
Fat	4
Casein	3
Sugar	4.75
Ash	.75
Albumin	.5
	100.00

The contents chiefly of value in the manufacture of cheese are the fat, casein, water and a little sugar and mineral matter. Nearly all the sugar and albumin, about half the ash, and a little fat, escape in the whey during the process of manufacture.

Cheese is made by the action of rennet, which is an extract of the stomach of the young calf. It coagulates the casein and causes it to envelop the contents which are subsequently converted into cheese.

Changes due to Bacteria.

It is all important that some of the changes which the solids of milk are subject to should be understood. They are principally due to bacteria.

While in the healthy udder, the milk is practically free from bacteria, but as soon as it leaves the udder it becomes innoculated by various kinds that are always present in the atmosphere.

Immediately these bacteria gain access to the milk they begin to develop very rapidly. Milk at the natural temperature of the body is a most suitable medium for their development. One form feeds on the sugar, the result of which is that lactic acid is produced. This is the natural souring or ripening of the milk; and, in cheese-making, it is the adjustment of the various processes of manufacture to the development of the lactic acid that influences the matured product for good or ill. When proper precautions are taken with regard to cleanliness, the majority of germs that get into milk are of the class already mentioned, viz., those that produce lactic acid. When due attention is not paid to cleanliness, various filth germs get into the milk. These, feeding on the casein and other albuminoids, produce gases which form the pin holes and round holes in the curd and develop taints and bad flavours. A great variety of bacteria may get into the milk, if proper care is not taken to prevent them. If they are subjected to high temperatures, say 130 deg. Fah., and upwards, for a lengthy period, they will be destroyed. Low temperatures will check their development, so that by cooling the milk they are kept in check, and the development of acidity can be controlled by the cheese-maker.

The predominance of any particular class of germ in the milk has the influence of overpowering or keeping in check those that are in a minority; hence the use of pure cultures of the lactic acid bacillus which are known as starters. These starters are prepared from a pure culture supplied in a liquid form by the Department of Agriculture or from commercial cultures obtainable from the agents in the form of powder.

Necessity for Cleanliness.

As in all branches of dairying, cleanliness is of the greatest importance in cheese-making. Sufficient care is not devoted to the raw material by those who milk the cows and handle the milk before it is delivered into the factory, and it is at this stage that it is more liable to contamination from careless and uncleanly habits.

The cows must be provided with a clean water supply. If the supply is obtainable from the open dam, this must be fenced so as to prevent the cows polluting it with their own droppings. The mud thus contaminated sticks to the udders, and it is almost impossible to prevent some of it finding its way into the bucket while milking.

It must be borne in mind that dung in any shape or form is the worst form of contamination to which milk is exposed. For this reason, the yards and sheds must be kept clean; and, particularly in the summer, dry cow dung must not be allowed to accumulate about the yards. The cow shed and milk room must be regularly limewashed.

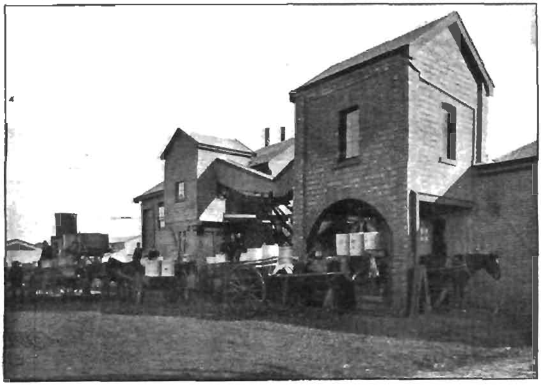
The cows' udders must be washed or wiped with a damp cloth. This is especially necessary in the spring time, or when the animals have a full supply of succulent fodder, which has a laxative effect. Extra care is then necessary to prevent contamination.

The milkers' hands should be washed before milking each cow. For this purpose, water may be provided in a five or ten gallon oil drum, with a tap. Dissolve some Condy's crystals in the water. This will help to prevent the spread of sore teats or other troubles due to germ life.

Only well tinned utensils should be used. As the tin wears off, giving rise to a rusty appearance, they must be re-tinned or replaced by new ones. The utensils should be cleansed by first rinsing with cold or lukewarm water, and then thoroughly scrubbed with hot water in which soda has been dissolved in the proportion of about ½ lb. to 10 gals. of water. Afterwards scald with boiling water and soda, steam thoroughly, and place upside down to drain and dry. A cloth should never be used in cleaning the utensils—always use a brush.

Care of Milk.

The milk should be strained through a "Ulax" strainer, which consists of wire gauze, and wadding disc which is burnt after use. If butter-cloth and wire strainer are used, take a fresh piece of butter-cloth for each milking and double it.



RECEIVING MILK AT THE BOISDALE FACTORY.

The night's milk should be removed from the shed to a clean milk room and run over a cooler to remove the animal heat; the reduced temperature also checks the development of bacteria and prevents the milk becoming over-ripe.

Before the milk is emptied into the receiving or making vat, it is the duty of every maker to examine the milk as to its condition. Thorough work at the receiving platform places one on the high road to success in the labour that follows. While the milk is being received into the vat, it should be stirred gently at intervals to keep the cream from rising to the surface. Use the thermometer to ascertain the temperature of the milk. If over 70 deg. do not apply the steam until you are sure that there is enough milk near at hand to fill the vat. If there is a suspicion that the milk is over-ripe, test it for acidity, as described elsewhere, or make a rennet test; if it proves to be over-ripe, the whole process must be hurried on to keep ahead of the acid. If, on the other hand, the milk is found

to be fresh and sweet, a good starter must be used. Should there be any bad flavours evident, a good starter will also assist in overcoming them.

Starters for Cheese-making.

In preparing starters from commercial cultures for cheese-making, it is essential that all vessels be washed and scrubbed in tepid water and soda and then thoroughly rinsed with hot water and soda, and sterilized with steam.

It is advisable to get the best milk obtainable and as fresh as possible from cows that have not advanced too far in their period of lactation. The milk should be strained through a Clax strainer before putting it into the can or bucket in which it is scalded.

Stand the vessel in a trough of water heated by steam. Keep the water boiling slowly to prevent any water splashing into the milk. In this way, the temperature of the milk is raised up to nearly boiling point (say 200 deg.) and should be maintained at that temperature for half an hour, stirring occasionally with a clean sterilized rod.

Take the can out and strain the milk into a clean vessel, and wash the can first with cold water and then hot water and soda, and sterilize with steam.

Take one gallon of the scalded milk and cool down to 80 deg. when the culture may be added, stirring it in thoroughly with a clean glass rod.

Cover the top of the vessel with a piece of clean cheese cloth that has been scalded and dried, to prevent any flies or dust getting in.

Set the can in a tub of water at a temperature of 78 deg., giving the milk a stir for the first 5 hours at intervals and maintaining that temperature from 18 to 24 hours. The startoline should be nicely thickened; skim off about 3 ins. and discard it. Stir it up with a clean glass rod till it becomes like cream and keep back one pint to be used to start the second day's pasteurized milk.

The second propagation should be started at a lower temperature (about 180 deg.) and maintained at 70 deg. for the same period.

Test the acidity by using the acidimeter test which should be 0.65 per cent. Keep back about 1½ pints to be added to third day's pasteurized milk.

The third propagation should be cooled down to from 65 to 70 deg. and kept at that degree from 18 to 24 hours. This propagation will be found sufficient to set the ordinary starter. The quantity to be used for the ordinary starter will depend on the acidity developed, which should not exceed 0.80 to 0.85 per cent. One per cent. to 1½ per cent. will be sufficient if the starter is mild to the sense of smell, clean and sharp to the palate, and firmly coagulated. If found to be over-ripe, use less.

It is a very important matter that the starter be kept covered and in a pure atmosphere. Before using a starter always reject 1 in. from the top of the starter which is not so good. The starter should be poured from one vessel to another until it becomes smooth and uniform. If it is found desirable to add the starter to the vat of milk after the temperature has been raised, mix the starter with an equal quantity of warm milk from the vat. After pouring from one bucket to another it may be put into the vat by straining it through cheese cloth so as to prevent the cold starter from curdling or forming into white lumps, causing mottled cheese.

A good clean flavoured starter gives the desired flavour, aroma, and keeping quality, required in cheese. A poor flavoured one should never be used, as it spoils the flavour of the whole vat of milk.

The Rennet Test.

Heat a small quantity of milk in a dipper placed in hot water, raising *the temperature to 84 deg. or 86 deg.* Take a 4-oz. glass measure of the milk and pour into an enamel mug, place in it a small chip or cork, pour in one drachm of rennet, and stir vigorously for 10 seconds with a clean teaspoon or a glass rod; then withdraw the spoon and watch when the chip stops. If the chip stops quickly, the milk is over-ripe.

The Acidimeter or Titration Test.

The acidimeter or titration test is based on the fact that one cubic centimetre of decinormal solution of caustic soda will neutralize .009 gramme of lactic acid.

APPARATUS FOR ACIDIMETER TEST.

To make the test, put 10 c.c. of the liquid to be tested in a white cup, and add two drops of phenolphthalein solution, which acts as an indicator of the point that neutralization of the acid by the soda takes place by the production of a pale pink colouration. Fill a *burette graded in one-tenth of cubic centimetres* with the soda solution, but not above the 0 mark. Note the point at which the solution in the burette stands; then turn the tap, and allow the solution to run gradually into the milk, stirring with a glass rod all the time. Each drop of the solution produces a pink colour, but when stirred it immediately disappears until the soda solution neutralizes the acid, when a permanent pink colouration is produced. As soon as this point is reached note how far the liquid has run down the burette; and if it has dropped 22 spaces, equal to 2.2 c.c. The percentage of acid is calculated as follows:—

$$\frac{2 \cdot 2 \times \cdot 009 \times 100}{10} = \cdot 198\text{—the percentage of lactic acid present.}$$

A quicker and simpler way of making the test is to take 9 c.c. of the *liquid to be tested*, when the number of spaces of the soda solution used will indicate the percentage of acid present. For instance, say, it takes 22 spaces to neutralize the acid, then—

$$\frac{2 \cdot 2 \times \cdot 009 \times 100}{9} = \cdot 22 \text{ per cent. of acid.}$$

The temperature of the milk does not influence the titration test.

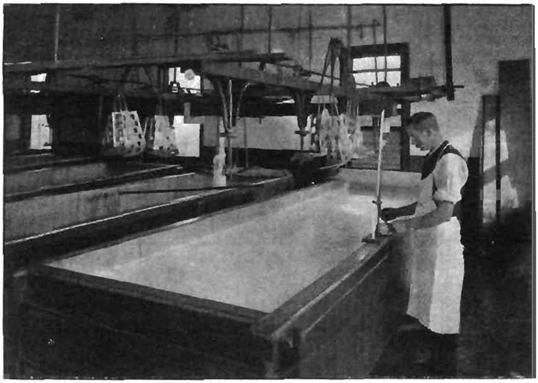
Various Stages of Manufacture.

Commercial Starter.—A good starter is the foundation of cheese-making, as it is composed almost entirely of lactic acid bacteria; and, in adding it to the milk, millions of desirable germs are introduced and help to crowd out the undesirable ones. Use from ½ to 1½ per cent. according to the sweetness of the milk.

Above all, never use whey for a starter. Sour whey always contains undesirable germs, and these will be transmitted from one day's milk to the next.

Heating the Milk.—The temperature of the whole milk should be raised to 84 deg. or 88 deg., according to its richness. In spring, a lower setting temperature and a comparatively larger quantity of rennet should be used. As the season advances, and the milk gets richer, the setting temperature should be raised.

Testing Acidity of Milk.—The milk is now tested with the acidimeter test to ascertain its acidity. The acidities which give the best results are .22, .225, and .23, depending on the condition of the milk and the amount of starter used.



SETTING OR COAGULATION OF MILK.
Cheese-maker taking the acidity test.

Colouring.—The colouring depends on the strength used; from 1 oz. to 1½ oz. to 1,000 lbs. of milk gives the right colour. It should be mixed in half a gallon of cold clean water, and gently stirred into the milk.

Rennet Test.—Before setting the milk, a rennet test should be made. From 18 to 20 seconds is the proper time for normal working milk. The time will vary with the season, condition of milk, and strength of rennet. The quantity of rennet used is from 3 ozs. to 4 ozs. per 1,000 lbs. of milk, and it must be diluted with half a bucket of cold clean water to each vat before pouring into the whole vat of milk. The water delays the action of the rennet for a few seconds.

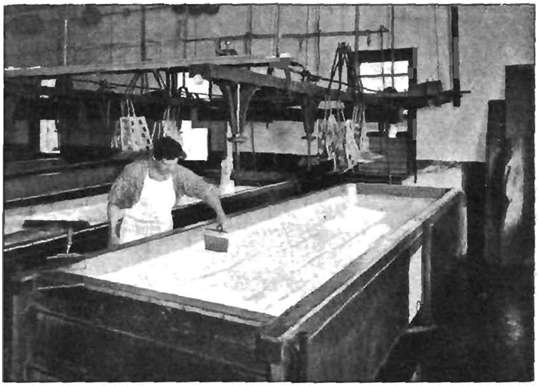
The rennet should be stirred into the milk with the curd rake or agitator for 2 to 3 minutes at a fairly fast rate; then slow down for 2 minutes so as to have the milk perfectly still before coagulation takes place. Withdraw the rake or blades of the agitator and skim off any dust or fat that may have accumulated on top of the milk. Put canvas cover over the top of the vat to keep the temperature from falling.

Coagulation.—Watch for the coagulation of the milk. If this occurs within 10 minutes, the curd should be ready to cut in 35 minutes from the time the rennet was added to the vat: or the time it takes to thicken × 2½ from the time it thickens, *i.e.*, 10 × 2½ = 25 + 10 = 35 min. from the time rennet was added.

Cutting the Curd.—To ascertain when the curd is ready to cut, wet the forefinger and insert it carefully into the curd and then raise. If the curd breaks cleanly and shows clear whey it is ready for the knife.

The horizontal knife should be used first, lengthwise of the vat. The curd then keeps in place better and allows a more uniform cut to be made with the perpendicular knife. The latter is used crosswise and once lengthwise. The cubes should be even and not over ⅜ in. in size.

The curd should be stirred gently by hand for 10 minutes and the curd adhering to the sides or bottom of the vat taken off before applying the curd rake or blades of agitator.



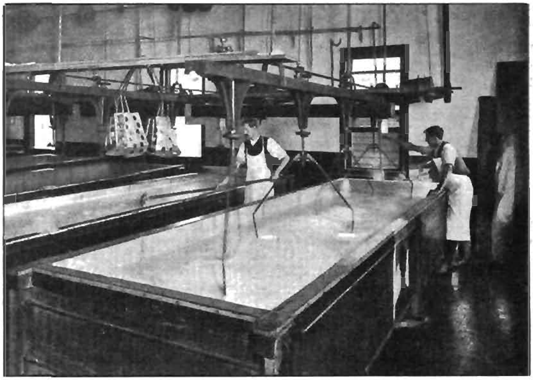
CUTTING THE CURD.

Testing Acidity of Whey.—A test of the whey should be taken before turning on the steam so as to know how the acid is working. With some milks and some starters showing a test of 0.14 per cent., three-quarters of an hour from rennetting will bring the curd on quite fast enough, while others, even at 0.15 or 0.16 per cent., may work too slowly in the same time.

Heating the Curd.—Steam should be applied through the medium of water under the vat, as there is less danger of scorching the curd. Turn the steam on slowly at first and gradually apply faster as the curd gets firmer. Stir constantly during the heating process, which should take from 40 to 45 minutes to raise the temperature to 98 or 100 deg. as the case may be.

After the curd is at the desired temperature, it should be stirred occasionally to keep it from matting and to insure even and thorough cooking.

Testing Acidity of Curd.—If the whey is showing 0.175 in two hours from setting the milk, remove the whey until the top of the curd may be



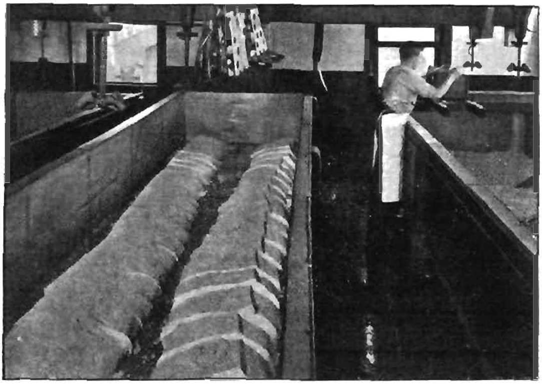
HEATING AND COOKING THE CURD.

seen; this checks the acidity from getting too far ahead. Mix the curd up by hand so as to get it nice, firm, springy, and elastic, so that when a

DRAWING WHEY OFF THE MAT.

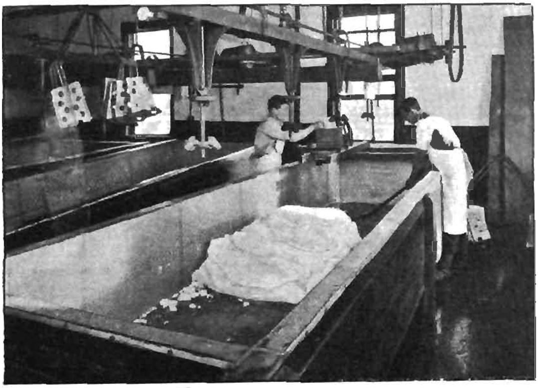
handful is squeezed together it will fall apart readily on relaxing the pressure, before running the whey off.

If the curd is well cooked, allow from 0.195 to 0.22 per cent. of acid before throwing the curd up on the racks in the vat.



MATTING THE CURD.

Well cooked curd requires very little stirring as the whey leaves it freely. It is of the greatest importance that the curd be cooked firmly, and that it contains sufficient acid before the whey is run off.

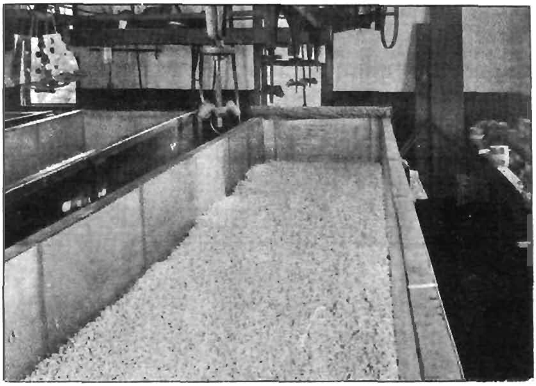


MILLING THE CURD.

Racking Curd.—The curd racks are made in 2 feet sections, from 4 to 6 ins. in depth, to fit inside the vats. Tilt the vat so that the top end is about 6 ins. higher than the bottom, and draw curd downwards. Put in the first section of rack and cover over with rack cloth. Dip enough curd on to the rack to make space for second rack. This process is continued till all the racks are in place.

Stir curd gently and level it back 8 to 10 ins. deep to mat. Test the acidity of the whey after racking; it should show from 0.285 to 0.30 per cent. in 2½ to 3 hours from setting the milk.

Matting the Curd.—Put cover over the top of the curd and allow it to mat from 10 to 15 minutes; then cut in strips lengthwise and crosswise in 8 to 10 in. blocks and turn over. Repeat the process until the curd becomes "meaty," and when pulled apart it splits instead of breaks. At the last turn, place the curd on the bottom of the vat and remove cloths



MELLOWING THE CURD.

and racks before milling, which generally takes two hours from racking. The temperature of curd at this stage should be 94 deg.

Milling Curd.—Knife mills should be used, giving a clean cut ⅜ in. to ½ in. in size. If smaller, they injure the curd, causing unnecessary loss of butter fat and spoiling the texture of the cheese.

Mellowing the Curd.—After the milling is completed, the curd should be turned over by hand, and covered to maintain the heat and prevent the curd from bleaching. Repeat the same process every 15 minutes for one hour after milling.

Testing Acidity of Curd.—Fifty minutes from milling make a small hole in the centre of the curd, so that the moisture will gather sufficiently to allow a test to be made. Aim at 1 per cent. of acidity, three hours after the curds are dry on the racks.

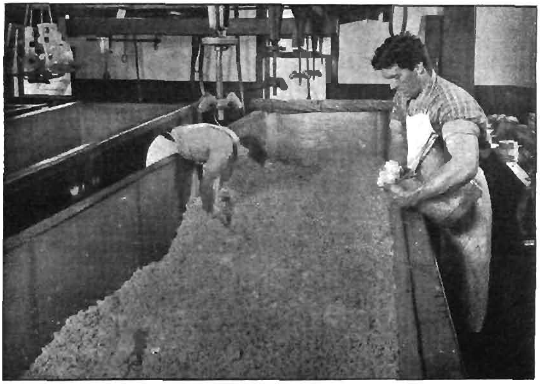
Turn the curd over by hand and cover up, repeating the previous process of mellowing. In half an hour the curd becomes soft and velvety,

and exudes a moisture of half fat and whey testing 1.05 to 1.10 acidity. The curd is then ready to salt.

Salting the Curd.—The amount of salt to be added depends upon the moisture in the curd and upon the length of time for ripening. Moist curd requires more salt than quickly ripening cheese. The rate varies from 2½ to 3 lbs. per 1,000 lbs. of milk.

If the temperature of the curd is 88 deg., let the water run from under the vat. The curd should be turned over and spread evenly over the bottom of the vat. Sieve half the salt on the curd and stir up thoroughly and evenly through the mass. The remainder should be put on and also well mixed.

Piling the Curd.—Pile the curd up in the centre of the vat so as to allow the whey to escape. The temperature of the curd at this stage should not exceed 84 deg. Cover the curd over for 20 minutes until the harsh



SALTING THE CURD.

feeling caused by the salt has disappeared; mix the curd up by hand and it will then be ready for the hoops.

Dressing Cheese Hoops.—In the bottom of the hoop place a clean cap cloth (hessian preferred). Use two cloths (seamless bandage). Wet the first cloth before putting it on, and do not have any on the bottom. Put the other cloth on and lap about 1 in. on the bottom of the hoop and cap cloth. When two cloths are used a silky skin is put on the cheese. The outside cloth is taken off in the morning and washed ready for the day's hoops.

Hooping the Curd.—The curd is now firmly packed into the hoops and weighed, and put into the press with the jointing of the inner hoops facing the gutter of the press.

Pressing the Cheese.—At first, the pressure should be applied gradually to the curd. When the whey starts to come away freely, stop screwing for 10 to 15 minutes; then screw up, repeating this process for one

hour. A quarter of an hour before dressing the cheese, pour three or four buckets of water gently over the hoops at a temperature of 130 deg., to assist in putting a good rind on it.

PRESSING.

Dressing Cheese.—After about one hour has elapsed the cheese should be removed from the press. and the operation known as dressing the cheese

DRESSING.

performed. This consists of trimming round the edge of the cheese, wetting the cap cloth with clean hot water, and pulling up the bandage and removing wrinkles so that the binding will lap ½ in. over the end. Wet the outer cap cloth and replace the cheese in the press, joining the inner hoops on the top. Pour three or four buckets of hot water on top of the hoops and gradually screw up fairly tightly. The maximum pressure is not put on until late at night.

The cheese should be turned in the hoops, end for end, and the outer bandage taken off in the morning, and any defects in appearance remedied. They are again returned to the press and allowed to remain in the hoops until they are required for the day's cheese. The outside bandage should be washed in hot water and spread over the top of the hoops to air and dry, so as to be ready for use when required.

After being taken from the press, the cheeses are removed to the maturing room to ripen.

MATURING ROOM AT BOISDALE.

Maturing.—The cheese should be turned every morning on the shelves in the maturing room, which should be well ventilated. The cheese shelves should be kept scrupulously clean and thoroughly washed at the end of the season with boiling water and washing soda. This keeps the cheese clean and helps to prevent mould. The floor also should be scrubbed and kept clean. Clean and neat cheese placed evenly on the shelves gives the room a nice appearance.

Hoops and presses should be washed thoroughly once a week, and cap cloths should be kept clean and sweet. The cheese vats, curd racks, curd cloths, etc., need special care in washing in order to keep them in first class condition. Curd racks should be left outside and well aired.

Keep the temperature down as much as possible during spells of hot weather, as overheated cheese loses flavour, discolours, and becomes bitter.

With cheese, as with everything else, every effort must be made to please the eye. Marketing cheese that are of unequal height or are lopsided, or the cloths of which are loose from some defect or carelessness in the process of making, is always unprofitable. Not only should the cheese be put up in a neat attractive form, but it should not come in contact with anything having a bad odour.

Daily Record.

The cheese-maker should keep a careful record during the various stages of manufacture. A chart embodying the following list will be found very helpful: —

1. Milk, ...lbs.
2. Acidity.
3. Fat test.
4. Starter used, per cent.
5. Temperature of milk before testing.
6. Colour, ...ozs.
7. Rennet test.
8. Acid test.
9. Rennet added, ...ozs.
10. Temperature set at.
11. Time set.
12. Time stirred.
13. Time to coagulate.
14. Time to cut.
15. Acidity of whey after cutting.
16. Time heat applied.
17. Acid of whey in 1½ hr.
18. Temperature cooked to.
19. Time cooked.
20. Acid in 2 hrs.
21. Acid in 2½ hrs.
22. Hot iron test.
23. Run whey off top of curd.
24. Curd in whey............hrs.
25. Acid of whey before racking.
26. Curd stirred dry on racks.
27. Acid of whey after piling.
28. Cut and turned in 15 minutes.
29. Left to mat, ...hrs.
30. Time milled.
31. Time curd left.
32. Acid of whey 1 hour from milling.
33. Time curd left before salting.
34. Acid of whey when salted.
35. Temperature of curd when salted.
36. Amount of salt.
37. Time of hooping.
38. Temperature of curd when hooped.
39. Time hoops in press.
40. Time started pressure.
41. Time dressed.
42. Time full pressure.
43. Pounds of cheese.
44. Amount of cheese per lb. of milk.
45. Weather conditions (temperature, humidity, &c.).

Fast Working Curds—How to Handle.

During a spell of warm weather the milk, as a rule, arrives at the factory or dairy in a very unsatisfactory condition. The heating should be so regulated as to have the desired setting temperature attained shortly after the last milk runs into the vat. A rennet test should be made before heating is completed by warming a sample up to the proper temperature. This indicates at once how far acidity has developed, and enables one to regulate the treatment accordingly. When milk is found to be working fast a lower setting temperature should be used, and a larger quantity of rennet added, so as to get the curd ready for the knife as soon as possible. *At a lower setting temperature, acidity does not develop so fast.* Cut the curd finer, giving an extra cut with the perpendicular knife.

The object is to get the pieces smaller so that they may expel their moisture more rapidly. When the curd gets a little firm, say 92 deg., remove a portion of the whey in order to control the development of acid, and add 3 per cent. of pure clean water at the same temperature as the whey.

In bad cases, all the whey can be removed down to the top of curd, and a second water added. This is found beneficial, as it checks the acid and allows a firm curd to be made before dipping on the racks.

GASSY CURDS.

The presence of gas is generally noticed by the slow ripening of the milk. Strong putrefactive fermentations (or taints) are also discovered as the result of examination at the receiving can and milk vat. In such cases, the milk should be ripened at a lower temperature, and more acidity allowed to develop before setting. Do not cut finely; aim at having the cubes larger so as to retain the moisture. Stir longer before turning on steam; heat slower than with ordinary curd. If very gassy, hold temperature a couple of degrees lower, say at 94 deg., until the acidity begins to develop. This prevents the curd from getting too firm before the acidity is present. When, however, the acidity is coming on nicely, the temperature should be raised to 98 deg. so as to get the curd properly cooked before dipping.

Always allow more acid to develop in the curd before drawing off the whey; do not stir too dry. If well cooked, leave the curd on the bottom of the pan instead of racking. A shade more acid in the whey and more moisture left in the curd will assist in checking the gaseous fermentation of the latter. If the gas continues to check the acidity, and the curd is still working slowly, cut the curd in larger pieces than usual. These will retain the moisture and temperature better, and thereby aid development of acidity. If, on the other hand, too much moisture is present and acidity is developing too rapidly, cut the pieces smaller, mill earlier, and mature well before salting. When the curd has flattened out, all holes have disappeared, and the flavour is fairly clean, salt heavier than with ordinary curds. This will assist in retarding the effects of the bad flavour as the cheese ripens.

FAULTS IN CHEESE.

Acid Flavours in cheese are due to ripening the milk too much before adding the rennet, using too much starter and not firming the curd sufficiently before drawing off the whey. Prevent the development of too much acid in the milk before rennetting. On no account should sour milk be accepted from any supplier.

If the milk is found to be well advanced, keep back the starter till ready to add the rennet to the vat of milk; use very little (from ¼ to ½ per cent.), according to the condition of the milk.

Rancid Flavours are due to filth germs caused through allowing cow manure and dust to gather in the cow-bails, and also by impure air where the milk is kept over-night in badly ventilated rooms. Utensils and straining cloths that have not been thoroughly washed and scalded, and bad flavoured starters, should not be tolerated.

Bitter and Yeasty Curd are due to receiving milk in cans in which sour whey from dirty tanks is returned. All whey tanks should be constructed to allow whey to be carted away and the tank washed out thoroughly daily with hot water, and plenty of fresh air let in.

Whey that has been pasteurized is much better for feeding young calves and pigs, and does away with the sour disagreeable odour so hard to get out of the cans.

Weak Body and Open Texture are entirely due to faulty methods of manufacture, and there is no one else to blame but the cheese-maker. The body of the cheese is determined very largely by the condition of the curd at the time the whey is removed. If the curd at this stage is soft and tender, the probabilities are that the cheese will be short and tender in the body.

If the acidity is allowed to over-develop while the curd is in a soft condition, a more or less sour cheese will be the result. It is not the amount of acid in the curd at the time the whey is run off that indicates whether a cheese will be sour or not, but rather the condition of the curd as regards firmness when the acid develops.

Openness in the Cheese is due to not allowing the curd to mellow down sufficiently before adding the salt and putting into press too soon. A sweet cheese is always open, because it resists the pressure and puffs and swells after removal from the press.

Mottled Colouring—an uneven development of acid and moisture in the curd. This can be avoided by uniform cutting, heating and stirring, using ⅜ horizontal knife first lengthwise of the vat and then cutting with the ⅜ perpendicular knife crosswise of the vat and lengthwise. Mix the curd up by hand and then give it an extra cut lengthwise of the vat, giving a smaller cut which makes it much easier to get the curd firmed.

Starters should always be strained through a layer of cheese cloth and added to the vat of milk before the colouring.

The curd left over from the previous day should be placed in the corner of the vat after the day's curd has been piled up on the racks. The drippings from the curd will warm it up. Drain off the curd before milling, pull the curd into a heap, and salt apart. When hooping the fresh curd, put the stale in the bottom of a hoop.

The chief advantage of matting the curd is to improve the texture and body of the cheese. The curd must be turned frequently on the racks in order to prevent the whey forming in pools on the curd.

The effects of salt on curd are to expel the moisture; to improve flavour, body and texture of the cheese; to retard ripening or curing; and to add keeping quality to the cheese. If salt be applied to the cheese before it becomes velvety, the quality of the cheese is not so good.

A really fine cheddar cheese should have a clear pure silky and firm appearance when drawn by the trier. There should be no stickiness or pastiness on touching it; neither should there be any holes in the meat, or streakiness in the colour. It should be pleasant to the eye, and sweet to the nose and the palate.

Trade Terms.

Flavour.—In common with other edible commodities, flavour is of the utmost importance in cheese. The flavour of high grade cheese is agreeable to the palate, is nutty, clean, and devoid of any bitter or objectionable after-taste.

Texture.—Perfect texture is shown when a plug or cut surface of the inside cheese presents a solid, compact appearance, free from breaks or holes.

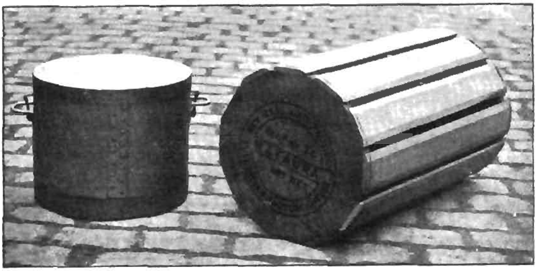
Body.—This term refers to the consistency, firmness, or substance of the cheese. Perfect body is indicated by its being solid, firm and smooth in consistency.

Colouring.—The colour varies according to demand on the London market. When colouring matter is used, the quantity added should be 60 per cent. more than is used for the local and inter-State markets.

Export Crates.

The cheese crate should be neat, strong and tight, the timber being well seasoned, and dressed both sides and ends; a further improvement in appearance is effected by bevelling the edges of the battens. Green timber

should never be used, as it causes the rind to become softened, and is liable to impart a bad flavour to the cheese, and to occasion the development of mould. Care should be exercised to get the crates as nearly as possible the same size as the cheese; or, in other words, the cheese should be made of a uniform size to fit the crate. When this is done, they look neater and are prevented from moving about; the packages also take up less space and unnecessary surplus weight is avoided. The most suitable size for the London market is a cheese weighing 80 lbs.



CHEESE HOOP AND CRATE.

The partition between the cheese should be securely nailed, and the ends of the crates bound with 14 gauge pliable wire, with ½-in. staples, or galvanized iron hoop (¾-in.).

On each end of the crate there must be impressed the full trade description, setting out the name of manufacturer or his registered brand, and the word "Australia," together with the net weight of the contents. On each crate it should be plainly stencilled whether the cheese is white or coloured.

ANSWERS TO CORRESPONDENTS.

The Staff of the Department has been organized to a large extent for the purpose of giving information to farmers. Questions in every branch of agriculture are gladly answered. Write a short letter, giving as full particulars as possible, of your local conditions, and state precisely what it is that you want to know. *All inquiries forwarded to the Editor must be accompanied by the name and address of the writer.* This is very necessary, as sometimes insufficient information is furnished by the inquirer.

Harvesting Paspalum Seed.—J.R. asks how paspalum seed should be gathered.

Answer.—Strip by hand as each head ripens. The seed does not mature evenly; and, if allowed to get very ripe, will shell.

Mouldy Silage.—C.O. inquires as to cause of failure of a small stack of silage. On opening the stack, it was found that a sort of white mould had spread right through it.

Answer.—Insufficient pressure and the presence of air in the stack are the causes of mould. Small stacks, especially of thick stalked fodders, are always unsatisfactory.

Mating Fowls.—J.E.R. proposes to mate a Leghorn cockerel (11 months) with some 8½ months' old pullets.

Answer.—It is better to mate second or third season hens with a good cockerel. Chickens bred from immature parents lack stamina. Ten hens are enough to mate with a vigorous cockerel.

DEATH OF TURKEYS.—E.A.W. reports concerning his bronzewing turkeys. "Stand about, with wings dropped; will not eat; droppings yellow; sick couple of days; then dead."

Answer.—The turkeys are suffering from severe diarrhœa. Remove all water; avoid feeding grain, and give skim milk only. Also give the following mixture:—Two raw eggs beaten up, 1 tablespoonful of brandy (or whisky), 1½ grains of quinine, and 1 tablespoonful of skim milk. Mix thoroughly and divide into four doses. Administer by pouring down over tongue.

CARBIDE WASTE.—E.A.W. asks whether carbide waste will hurt fowls.

Answer.—Eggs from yards where carbide waste has been used are sometimes found to possess a disagreeable flavour, due to the carbide being carried into nests and impregnating the eggs. Its action on poultry would be similar to that of slaked lime. It is best left alone.

FLAGGING.—W.H.E. writes: "My cow calved three days ago. Her udder is exceptionally large, each of the quarters being swollen and very hard. The swelling also extends upwards at the back of the udder. It is not painful, and she gives a good flow of milk. She was much the same with her last calf, but the trouble passed away after a few weeks."

Answer.—The condition of your cow's udder is what is called "Flagging." It is more or less present in most cases at calving. Warm fomentations and massage will reduce the condition, which, if neglected, at times induces mammitis.

GRADE BULL.—P.S.B. asks whether it is advisable to keep, for stud purposes, a bull calf by a pure bred Jersey bull out of a pure bred Red Polled Angus heifer.

Answer.—It is never advisable to use a grade bull.

RINGBONE.—D.M.K. asks whether it is possible for a horse to have ringbone except on the pasterns.

Answer.—Bony enlargements of the pastern bones only are termed ringbone.

RUBBER HOSE FOR INJECTIONS.—J.R. asks what kind of hose should be used for injections on horses.

Answer.—About four feet of ordinary ¾-in. hose may be used in case of emergency. A proper one may be obtained at any surgical instrument maker.

DEFECTIVE QUARTER.—H.T.H. states one quarter of the udder of a cow that has just calved is defective. Before milking, the quarter looks full like the others, but the milk does not come down freely—the milker is only able to get a small strip at a time.

Answer.—The cow has evidently some teat obstruction, probably a constricted sphincter muscle. Interference would be likely to increase the trouble, unless under the direction of a veterinary surgeon.

DIFFICULT PARTURITION (EWES).—P.K. writes: "Some of my ewes have died after lambing. The vagina appears to turn completely inside out, death occurring in a few days. I treated two by returning the passage, but they died after about a week."

Answer.—The condition is due to difficult parturition. Watch the ewes well, and return the organ after washing thoroughly with a warm solution of alum as quickly as possible. If it is not retained, replace and put a loose stitch across the passage. Syringe out daily with warm solution of Condy's fluid.

MOLASSES.—P.J.H. asks what quantity of molasses should be given to each cow.

Answer.—Dissolve 3 lbs. of molasses in about two gallons of water. With this the feed is dampened.

DIET FOR SOW WITH LITTER.—P.J.H. asks what is the best diet for a sow with young.

Answer.—Give no feed for first twenty-four hours, but supply plenty of lukewarm water. For first ten days, feed sparingly on sloppy foods, working gradually into a full ration of crushed barley, oats, bran (half the quantity of the grain) and plenty of skim milk.

SHEEP BOOKS.—W.W. asks for names of books dealing with sheep management and diseases.

Answer.—Hawkesworth's *Australian Sheep and Wool* and Armytage's *Sheep Doctor*. The latter deals mainly with English diseases and is not applicable in every case to Australia. There is no work dealing fully with practical sheep management and breeding as carried out under our conditions. During the past four years numerous articles on the subject have appeared in the *Journal*.

ADDING SALT TO CREAM.—W.A. wishes to know whether adding salt to cream will make any difficulty when testing.

Answer.—No, but it is not advisable to add anything to cream if it is to be sent to a factory for butter-making.

REMINDERS FOR NOVEMBER.

LIVE STOCK.

Horses.—Continue to feed stable horses well; add a ration of greenstuff. Rug at night. Continue hay or straw, chaffed or whole, to grass-fed horses. Feed old and badly-conditioned horses liberally. If too fat, mares in foal should be put on poorer pasture.

Cattle.—Except on rare occasions, rugs may now be used on cows on cold and wet nights only. Continue giving hay or straw. Give calves a warm dry shed and a good grass run. Continue giving milk at blood heat to calves.

Pigs.—Supply plenty of bedding in warm well-ventilated styes. Keep styes clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run.

Sheep.—Prepare for dipping. Powder and paste dips are most effective, particularly where lice are prevalent. Ascertain exact contents of bath before adding dip. Keep sheep in bath not less than half a minute. Submerge heads. Dip big sheep first, lambs last. Commence early in the day; sheep can then dry before nightfall. Do not dip sheep when heated or full. Clean out baths occasionally.

Poultry.—Provide plenty of green food and shade. Watch for vermin; spray perches with kerosene and houses with a solution of 3 per cent. crude carbolic acid mixed with a little lime and soft soap. Keep water clean and cool. Discontinue feeding maize and reduce meat ration. Some Epsom salts should be placed in water weekly. Fresh skim milk, if available, should be given.

CULTIVATION.

Farm.—Plant main crop of potatoes. Cut hay, maize, silage. Weed early potatoes. Sow maize and millets. Weed tobacco beds, and water, if dry.

Orchard.—Ploughing, harrowing, and cultivating to be continued. Weeds to be kept down. Secure, pinch, and spray grafts with water. Spray frequently for codlin moth, pear and cherry slug, and peach aphis. Plant out citrus trees.

Vegetable Garden.—Hoe and mulch surface. Suppress weeds. Water where dry and hoe afterwards. Disbud and pinch back tomato plants. Sow celery, French beans, peas, lettuce, cucumber, melon, &c., seeds.

Flower Garden.—Water and mulch. Cultivate and keep down weeds. Thin out weak wood from roses. Prune all flowering shrubs that have finished flowering. Lift and store bulbs. Plant out dahlias and chrysanthemums. Liquid-manure herbaceous perennials.

Vineyard.—Cultural work, such as scarifying and hoeing, should be actively pushed forward, so as to provide as good a "mulch" as possible during summer. Proceed with tying up, stopping, and topping. Avoid excessive topping, summer pruning being usually more injurious than useful in warm, dry climates. Cincture Zante currant vines when flower caps are about to fall. Apply second sulphuring just before blossoming, wherever Oidium was prevalent last year.

Cellar.—Same as last month.

SOY BEANS—SEED FOR DISTRIBUTION.

The Department of Agriculture has imported a supply of Soy Beans (Yellow variety), and is now prepared to distribute the same amongst intending growers. Price—5s. 9d. per bushel (60 lbs.). Quantity required to seed one acre—½ bushel.

Applications, accompanied by Postal Note or Cheque covering cost of quantity required, should be forwarded to the Director of Agriculture, Public Offices, Melbourne. Freight payable on delivery.

See article on "The Soy Bean" in the September *Journal*.

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VICTORIAN TREE PLANTING COMPETITION, 1912-15.

J. M. Reed, I.S.O., Surveyor-General.

In two previous papers published in this *Journal** I endeavoured to impress on its readers the great importance of systematic tree planting as an aid to settlement. Unfortunately, the idea that tree growth is opposed to the interests of settlement is much too prevalent, and the work of destruction, rather than preservation or renewal, is in general operation. The experience of other countries furnishes abundant evidence of the need of greater interest in this subject and, where formerly wholesale destruction was the rule, we now find active effort to promote timber growth.

In the United States excellent work is being done, it being now fully realized that the future welfare of the nation is dependent to a great extent on its timber supplies, and this question has, in the country named, been designated "Our greatest problem." To Australians, the subject should be of special interest, as Australia is the home of the Eucalypt, the particular tree which is now claiming the attention of the world, and which is being planted in every continent, its great value being recognized and its growth promoted. The late Baron von Müeller, formerly Government Botanist of Victoria, to whom we owe so much for our knowledge of the Australian flora, wrote the following:—

> The Eucalypts are destined to play a prominent part for all time to come in the sylvan culture of vast tracts of the globe; and, for hardwood supplies, for sanitary measures, and for beneficent climatic changes, all countries within the warmer zones will, with appreciative extensiveness, have to rely on our Eucalypts during a yet uncountable period.

So highly are the Eucalypts valued in America that the following official testimony has been given—

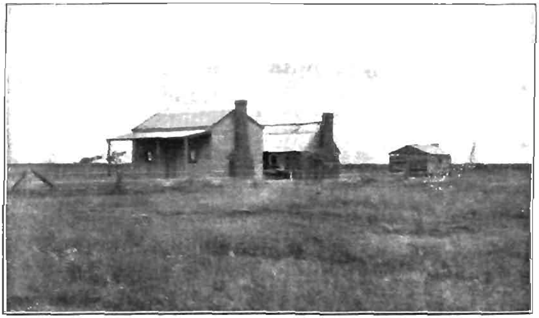
> In fact, they have probably served more æsthetic and utilitarian purposes than any other forest trees that have been planted on this continent.

It is not suggested that planting should be restricted to one special variety of tree. Although the Eucalypt is undoubtedly the most valuable timber tree, many others claim attention on account of their peculiar

* "A Plea for Tree Planting and Tree Preservation," *Journal of Agriculture*, December, 1906.—"The Importance of Tree Planting," *Journal of Agriculture*, September, 1909.

suitability for the purposes of shelter, shade, and windbreaks, and for ornamentation, all of which are of great importance to the farmer.

In Southern Europe, in Africa, in Asia, and in North and South America, tree planting has been systematically undertaken. The Japanese



CHEERLESS AND UNPROTECTED—A NORTHERN DISTRICT HOME.

are fully alive to its importance; both in Japan and Korea the work has been instituted. The growing popularity of Arbor Day, the establishment of tree growing clubs, and the wider interest being developed in

DEAD TIMBER SURROUNDING A GIPPSLAND HOME—NO ATTEMPT AT TREE PLANTING.

the subject of tree culture, must be regarded with a great measure of satisfaction. In one of the papers previously referred to, I suggested that, by *offering substantial prizes*, the competitive spirit might be

encouraged in this State with good results. I am pleased to state that the Government of Victoria has now accepted the suggestion. The details of a competitive scheme have been carefully worked out by a committee appointed for the purpose, and consisting of the horticultural representatives of the *Australasian* (Mr. Joseph Harris), *Leader* (Mr. D. M. Dow), *Weekly Times* (Mr. J. Callander), with the Conservator of Forests (Mr. H. R. Mackay), the Director of the Botanical Gardens (Mr. J. Cronin), and the Surveyor-General.

The Committee submits the scheme with the hope that it will claim the attention of a very large number of our farmers and induce a keen competition, the beneficial results of which will be in striking evidence in years to come. If the young people on our farm lands can be encouraged to devote their time and energies to this good work, they will derive from it a great amount of satisfaction and pleasure, and find in it a most healthy and enjoyable recreation.

A COMFORTABLE FARM HOME WELL SCREENED BY YOUNG TREES.

In the following memorandum the full particulars are set forth, and two lists of trees appended. The seven divisions have been so arranged in order to permit, as far as possible, of competitors meeting on fairly equal terms as regards climatic conditions. It is advised that competitors should give their attention to the smaller list of trees (No. 1) at first; and, as opportunity occurs, make use of the larger and more varied one (No. 2).

Forms of entry and all particulars may be obtained, either by personal or written application, at the Inquiry Branch, Crown Lands Department, Melbourne, and at any of the district land offices within the State.

COMPETITION CONDITIONS.

The State Government, in order to encourage tree planting in connexion with land settlement, has decided to offer prizes for competition, under the following conditions:—

The State is to be divided into seven divisions—

1. Mallee country.
2. Dry northern country (without irrigation).
3. *Southern country* (coastal, plain, and upland).

4. Hill country (not heavily timbered).
5. Hill country (formerly forest, more or less cleared and old timber killed).
6. Small holdings (irrigated).
7. Small holdings (not irrigated).

On receipt, the entries will be classified under these various divisions and the competitors notified.

The following table sets forth the minimum area of the holding that will be recognized, the minimum area that must be planted, and the value of the prizes in each division:—

Division.	Minimum Size of Holding.	Minimum Area to be Planted.	Prizes. 1st.	2nd.	3rd.
			£	£	£
1	400 acres	4 per cent.	60	25	15
2	200	4	60	25	15
3	100	4	60	25	15
4	100	4	60	25	15
5	75	4	60	25	15
6	20	*2 acres (excluding fruit trees)	25	15	10
7	20	*2 acres	25	15	10

*For areas over 20 acres the minimum to be planted will be determined after receipt of entry.

A certificate will be issued to every prize-taker, and a gold medal to all winners of a first prize.

In judging the work of the competitors consideration will be given to the following points:—

Value of the plantation for shelter and shade purposes.
Value of the plantation for windbreaks.
Value of the plantation for timber supply.
Value of the plantation for ornamental purposes and general utility.

Entries are to be lodged with the Secretary for Lands on or before the 1st January, 1912, and prizes will be awarded after three years, dating from 1st May, 1912.

If less than twelve entries are received in any division, no prizes will be awarded in that division.

SUITABLE TREES AND SHRUBS.

List No. 1.

(This list is recommended for competitors' attention as a beginning.)

Divisions 1 and 2.

Mallee Country and Dry Northern Country.

Shelter, Shade, and Windbreaks.

Monterey Cypress (*Cupressus macrocarpa*).
Monterey Pine (*Pinus insignis*).
Bull Oak (*Casuarina glauca*).
Currajong (*Sterculia diversifolia*).
Sugar Gum (*Eucalyptus corynocalyx*).
Pepper Tree (*Schinus Molle*).
Silky Oak (*Grevillea robusta*).

Timber.

Sugar Gum (*Eucalyptus corynocalyx*).
White Ironbark (*Eucalyptus leucoxylon*).
Red Ironbark (*Eucalyptus sideroxylon*).

List No. 1—continued.

Ornamental and other purposes.

Cootamundra Wattle (*Acacia Baileyana*).
Cedar Wattle (*Acacia elata*).
False Tree Lucerne or Tagasaste (*Cytisus proliferus*).
Victorian Laurel (*Pittosporum undulatum*).

Division 3.

SOUTHERN COUNTRY (COASTAL, PLAIN, AND UPLAND).

Shelter, Shade, and Windbreaks.

Sugar Gum (*Eucalyptus corynocalyx*).
Gippsland Mahogany (*Eucalyptus botryoides*).
Monterey Pine (*Pinus insignis*).
Aleppo Pine (*Pinus Halepensis*).
Monterey Cypress (*Cupressus macrocarpa*).
Pepper Tree (*Schinus Molle*).

Timber.

Sugar Gum (*Eucalyptus corynocalyx*).
Yellow Box (*Eucalyptus melliodora*).
Monterey Pine (*Pinus insignis*).
Canary Island Pine (*Pinus Canariensis*).
Corsican Pine (*Pinus laricio*).

Ornamental and other purposes.

Scarlet Flowering Gum (*Eucalyptus ficifolia*).
West Australian Red Gum (*Eucalyptus calophylla*).
False Tree Lucerne or Tagasaste (*Cytisus proliferus*).
Cootamundra Wattle (*Acacia Baileyana*).
Cedar Wattle (*Acacia elata*).

Division 4.

HILL COUNTRY (NOT HEAVY FOREST).

Shelter, Shade, and Windbreaks.

Sugar Gum (*Eucalyptus corynocalyx*).
Yellow Box (*Eucalyptus melliodora*).
Peppermint Gum (*Eucalyptus amygdalina*).
Monterey Pine (*Pinus insignis*).
Aleppo Pine (*Pinus Halepensis*).
Monterey Cypress (*Cupressus macrocarpa*).
Victorian Laurel (*Pittosporum undulatum*).

Timber.

Sugar Gum (*Eucalyptus corynocalyx*).
Forest Red Gum (*Eucalyptus tereticornis*).
Blue Gum (*Eucalyptus globulus*).
Canary Island Pine (*Pinus Canariensis*).
Corsican Pine (*Pinus laricio*).
Blackwood (*Acacia melanoxylon*).

Ornamental and other purposes.

Scarlet Flowering Gum (*Eucalyptus ficifolia*).
West Australian Red Gum (*Eucalyptus calophylla*).
Portugal Oak (*Quercus lusitanica*).
Cedar Wattle (*Acacia elata*).
Cootamundra Wattle (*Acacia Baileyana*).
White Mulberry (*Morus alba*).

Division 5.

HILL COUNTRY (MORE OR LESS CLEARED AND OLD TIMBER KILLED).

Shelter, Shade, and Windbreaks.

Sugar Gum (*Eucalyptus corynocalyx*).
Gippsland Mahogany (*Eucalyptus botryoides*).
Monterey Pine (*Pinus insignis*).
Monterey Cypress (*Cupressus macrocarpa*).
Aleppo Pine (*Pinus Halepensis*).
Victorian Laurel (*Pittosporum undulatum*).

Timber.

Blue Gum (*Eucalyptus globulus*).
Mountain Ash (*Eucalyptus amygdalina-regnans*).
Blackwood (*Acacia melanoxylon*).
Canary Island Pine (*Pinus Canariensis*).
Corsican Pine (*Pinus laricio*).

Ornamental and other purposes.

West Australian Red Gum (*Eucalyptus calophylla*).
Cootamundra Wattle (*Acacia Baileyana*).
Cedar Wattle (*Acacia elata*).
White Mulberry (*Morus alba*).
False Tree Lucerne or Tagasaste (*Cytisus proliferus*).
New Zealand Flax (*Phormium tenax*).

List No. 1—continued.

Divisions 6 and 7.

Small Holdings.

Shelter, Shade, and Windbreaks.

Gums (*Eucalypts*) of kinds, according to locality (*vide* other lists).
Monterey Pine (*Pinus insignis*).
Monterey Cypress (*Cupressus macrocarpa*).
Olive (*Olea Europæa*).
Loquat (*Eriobotrya Japonica*).
Pepper Tree (*Schinus Molle*).
Victorian Laurel (*Pittosporum undulatum*).
False Tree Lucerne or Tagasaste (*Cytisus proliferus*).

Ornamental and other purposes.

Wattles (*Acacias*) of kinds, according to locality (*vide* other lists).
Walnut (*Juglans regia*).
Camphor Tree (*Cinnamomum Camphora*).
Bead Tree (*Melia Azedarach*).
New Zealand Flax (*Phormium tenax*).

List No. 2.

Divisions 1 and 2.

Mallee Country and Dry Northern Country.

Shelter, Shade, and Windbreaks.

AUSTRALIAN TREES.

Currajong Tree (*Sterculia diversifolia*).
Bull Oak (*Casuarina glauca*).
Black Box (*Eucalyptus bicolor*).
Sugar Gum (*Eucalyptus corynocalyx*).
White Ironbark (*Eucalyptus leucoxylon.*)
Red Ironbark (*Eucalyptus sideroxylon*).
Silky Oak (*Grevillea robusta*).

EXOTIC TREES.

Monterey Cypress (*Cupressus macrocarpa*).
Olive (*Olea Europæa*).
Aleppo Pine (*Pinus Halepensis*).
Monterey Pine (*Pinus insignis*).
Locust Tree (*Robinia pseudacacia*).
Pepper Tree (*Schinus Molle*).

Timber.

AUSTRALIAN TREES.

Bull Oak (*Casaurina glauca*).
Black Box (*Eucalyptus bicolor*).
Sugar Gum (*Eucalyptus corynocalyx*).
White Ironbark (*Eucalyptus leucoxylon*).
Red Ironbark (*Eucalyptus sideroxylon*).
Silky Oak (*Grevillea robusta*).

EXOTIC TREES.

Monterey Cypress (*Cupressus macrocarpa*).
Monterey Pine (*Pinus insignis*).

Ornamental or other purposes.

AUSTRALIAN TREES.

Cootamundra Wattle (*Acacia Baileyana*).
Cedar Wattle (*Acacia elata*).
Golden-rain Wattle (*Acacia prominens*).
Victorian Laurel (*Pittosporum undulatum*).

EXOTIC TREES.

Box Elder or Manitoba Maple (*Acer negundo*).
Oleander (*Neriums*).
False Tree Lucerne or Tagasaste (*Cytisus proliferus*).

Division 3.

Southern Country (Coastal, Plain, and Upland).

Shelter, Shade, and Windbreaks.

AUSTRALIAN TREES.

Gippsland Mahogany (*Eucalyptus botryoides*).
Yate (*Eucalyptus cornuta*).
Sugar Gum (*Eucalyptus corynocalyx*).
Yellow Box (*Eucalyptus melliodora*).
Coastal Tea Tree (*Leptospermum lævigatum*).

EXOTIC TREES.

Monterey Cypress (*Cupressus macrocarpa*).
Nepaul Cypress (*Cupressus torulosa*).
Olive (*Olea Europæa*).
Canary Island Pine (*Pinus Canariensis*).
Aleppo Pine (*Pinus Halepensis*).
Monterey Pine (*Pinus insignis*).
Pepper Tree (*Schinus Molle*).

List No. 2—continued.

Timber.

AUSTRALIAN TREES.

Sugar Gum (*Eucalyptus corynocalyx*).
Yate (*Eucalyptus cornuta*).
Yellow Box (*Eucalyptus melliodora*).
Red Ironbark (*Eucalyptus sideroxylon*).
Forest Red Gum (*Eucalyptus tereticornis*).

EXOTIC TREES.

Canary Island Pine (*Pinus Canariensis*).
Monterey Pine (*Pinus insignis*).
Corsican Pine (*Pinus laricio*).

Ornamental and other purposes.

AUSTRALIAN TREES.

Cootamundra Wattle (*Acacia Baileyana*).
Green Wattle (*Acacia decurrens*, var. *normalis*).
Cedar Wattle (*Acacia elata*).
Acacia longifolia, var. *sophoræ*.*
Golden Wattle (*Acacia pycnantha*).
Willow Wattle (*Acacia saligna*).
Norfolk Island Pine (*Araucaria excelsa*).
West Australian Red Gum (*Eucalyptus calophylla*).
Scarlet Flowering Gum (*Eucalyptus ficifolia*).
Eugenias of sorts.
Victorian Laurel (*Pittosporum undulatum*).
New South Wales Brush Box (*Tristania conferta*).

EXOTIC TREES.

White Mulberry (*Morus alba*).
New Zealand Flax (*Phormium tenax*).
Tamarisks of sorts.
False Tree Lucerne or Tagasaste (*Cytisus proliferus*).
Lime or Linden Tree (*Tilia Europæa*).

Division 4.

HILL COUNTRY (NOT HEAVY FOREST).

Shelter, Shade, and Windbreaks.

AUSTRALIAN TREES.

Peppermint Gum (*Eucalyptus amygdalina*).
Gippsland Mahogany (*Eucalyptus botryoides*).
Sugar Gum (*Eucalyptus corynocalyx*).
Yellow Box (*Eucalyptus melliodora*).
Red Box (*Eucalyptus polyanthemos*).
Victorian Laurel (*Pittosporum undulatum*).

EXOTIC TREES.

Lambert's Spreading Cypress (*Cupressus Lambertiana*, var. *horizontalis*).
Monterey Cypress (*Cupressus macrocarpa*).
Nepaul Cypress (*Cupressus torulosa*).
Canary Island Pine (*Pinus Canariensis*).
Aleppo Pine (*Pinus Halepensis*).
Monterey Pine (*Pinus insignis*).
Yellow Pine (*Pinus ponderosa*).
Mammoth Tree (*Sequoia gigantea*).

Timber.

AUSTRALIAN TREES.

Blackwood (*Acacia melanoxylon*).
Sugar Gum (*Eucalyptus corynocalyx*).
Blue Gum (*Eucalyptus globulus*).
New South Wales Blackbutt (*Eucalyptus pilularis*).
Forest Red Gum (*Eucalyptus tereticornis*).

EXOTIC TREES.

Canary Island Pine (*Pinus Canariensis*).
Monterey Pine (*Pinus insignis*).
Corsican Pine (*Pinus laricio*).
European Ash (*Fraxinus excelsior*).

Ornamental and other purposes.

AUSTRALIAN TREES.

Cootamundra Wattle (*Acacia Baileyana*).
Green Wattle (*Acacia decurrens*, var. *normalis*).
Cedar Wattle (*Acacia elata*).
West Australian Red Gum (*Eucalyptus calophylla*).
Scarlet Flowering Gum (*Eucalyptus ficifolia*).
Red Flowering White Ironbark (*Eucalyptus leucoxylon*, var. *rosea*).

* Particularly suitable as a sand-stay.

List No. 2—continued.

EXOTIC TREES.

Sweet Chestnut (*Castanea sativa*).
Common Walnut (*Juglans regia*).
Bead Tree or White Cedar (*Melia Azedarach*).
New Zealand Flax (*Phormium tenax*).
Pin Oak (*Quercus palustris*).
White Oak (*Quercus alba*).
Portugal Oak (*Quercus lusitanica*).
Lime or Linden Tree (*Tilia Europæa*)
English Elm (*Ulmus campestris*).
American White Elm (*Ulmus Americana*).
White Mulberry (*Morus alba*).

Division 5.

HILL COUNTRY (FORMERLY FOREST, MORE OR LESS CLEARED AND OLD TIMBER KILLED).

Shelter, Shade, and Windbreaks.

AUSTRALIAN TREES.

Apple Tree (*Angophora intermedia*).
Satin Box (*Eriostemon squameus*).
Sugar Gum (*Eucalyptus corynocalyx*).
Gippsland Mahogany (*Eucalyptus botryoides*)
Victorian Laurel (*Pittosporum undulatum*).

EXOTIC TREES.

Monterey Cypress (*Cupressus macrocarpa*).
Nepaul Cypress (*Cupressus torulosa*).
Aleppo Pine (*Pinus Halepensis*).
Monterey Pine (*Pinus insignis*).
Yellow Pine (*Pinus ponderosa*).

Timber.

AUSTRALIAN TREES.

Blackwood (*Acacia melanoxylon*).
Mountain Ash (*Eucalyptus amygdalina-regnans*).
Blue Gum (*Eucalyptus globulus*).
Yellow Stringy Bark (*Eucalyptus Muelleriana*).
Messmate (*Eucalyptus obliqua*).

EXOTIC TREES.

Canary Island Pine (*Pinus Canariensis*).
Monterey Pine (*Pinus insignis*)
Corsican Pine (*Pinus laricio*).

Ornamental and other purposes.

AUSTRALIAN TREES.

Cootamundra Wattle (*Acacia Baileyana*).
Green Wattle (*Acacia decurrens*, var. *normalis*).
Cedar Wattle (*Acacia elata*).
Golden-rain Wattle (*Acacia prominens*).
West Australian Red Gum (*Eucalyptus calophylla*.)
Scarlet Flowering Gum (*Eucalyptus ficifolia*).

EXOTIC TREES.

Sweet Chestnut (*Castanea sativa*).
Cape Chestnut (*Calodendron capense*).
White Mulberry (*Morus alba*).
New Zealand Flax (*Phormium tenax*).
Pin Oak (*Quercus palustris*).
Portugal Oak (*Quercus lusitanica*).
False Tree Lucerne or Tagasaste (*Cytisus proliferus*).
Lime or Linden Tree (*Tilia Europæa*).

Divisions 6 and 7.

SMALL HOLDINGS.

Shelter, Shade, and Windbreaks.

AUSTRALIAN TREES.

Gums (*Eucalypts*) of kinds, according to locality (*vide* other lists).

EXOTIC TREES.

Monterey Pine (*Pinus insignis*).
Monterey Cypress (*Cupressus macrocarpa*).
Olive (*Olea Europæa*).
Loquat (*Eriobotrya Japonica*).
Pepper Tree (*Schinus Molle*).
Victorian Laurel (*Pittosporum undulatum*).
False Tree Lucerne or Tagasaste (*Cytisus proliferus*).

Ornamental and other purposes.

AUSTRALIAN TREES.

Wattles (*Acacias*) of kinds, according to locality (*vide* other lists).

EXOTIC TREES.

Walnut (*Juglans regia*).
Camphor Tree (*Cinnammomum Camphora*).
Bead Tree (*Melia Azedarach*).
New Zealand Flax (*Phormium tenax*).

PROPAGATION METHODS.

Every settler should have a small plot for the raising of his own trees. The following are some general methods which may be adopted for the sowing of tree seeds, viz. :—

1. *Indiscriminate or Broadcast Sowing.*—

(*a*) The area where the seed is to be sown should be in such a condition that the seed, when scattered, will find a ready lodgment either in the soil or in decaying vegetable matter suitable for inducing germination, and providing the necessary light, moisture, and nourishment for the future plants to establish themselves.

(*b*) The area may be scarified or ploughed and harrowed, being worked to a fine tilth, before sowing, if its natural condition is not suited for the reception of the seed.

2. *Sowing Seeds in Drills.*—

If necessary, the plough or a drilling machine may be run lightly along the lines where the seed is desired to be sown. This will allow light and moisture to penetrate the drills and stimulate the germination of the seeds.

SUGAR GUM PLANTATION, 2¼ YEARS OLD.

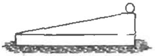
After sowing the seeds, they may be lightly covered with some friable soil, or the rake may be very lightly drawn along the drills, with the object of covering the seeds, which may then be gently pressed down with the foot.

3. *Seed Sowing in Prepared Open Beds or Shaded Frames.*—

The beds should be formed in some slightly sheltered position. The soil should be of two-thirds peaty or sandy nature and one-third of good loamy character. After thorough preparation and levelling of the beds, the seeds may be sown and lightly covered with fine soil and carefully hand-watered with can. When the seedling plants have developed, care must be taken not to allow them to become either too dry or over moistened.

It is sometimes an advantage to have the beds formed in frames or framed around thus :—

FRONT VIEW.



END VIEW.

so as to allow of calico-shading being rolled up or down, in order to provide for the protection of beds during unfavourable weather.

4. *Seed Sowing in Pots, Pans, or Flat Boxes.*—

The receptacles should be well drained. Use similar soil and exercise the same care as in the case of seed sowing in open beds.

Note.—In all cases of seed-sowing, the general practice may be adopted of covering the seeds with suitable soil to a depth corresponding to the size of the seeds.

Sowing of Pine Seeds.

The ground should be well dug, lined out in 4 or 5 ft. beds, and then raked to a fine surface. The pine seeds should be soaked in cold water, and allowed to swell. The water should then be drained off, and

SUGAR GUMS AND PEPPER TREES AT MILDURA—12 YEARS AFTER PLANTING.

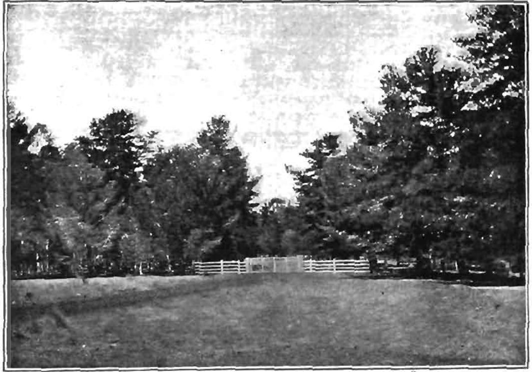
the seed placed under cover for a few hours. Drill lightly the beds in three or four lines, and sow the seed straight away in the drilled lines, and cover up with the back of a light rake. If the soil is dry, water well with watering can and fine rose, and keep the ground moderately moist. In ten or eleven months' time the seedling plants should be lifted, and transplanted in nursery lines, 3 to 4 in. apart and from 14 to 18 in. between the rows. In this position they can remain for one or two years. They will then be large enough to remove to their permanent quarters.

The sowing should be done during August and September, but this depends on the season and district, the northern areas being first planted. In 1 lb. weight of pine seed there are from 19,000 to 90,000 seeds.

The Raising of Gums.

Sowing in Beds and Boxes.—The seed can be sown from September to November, in open beds, boxes, pots, or pans. If in open beds, in the absence of a cement bottom something in the shape of hardwood boards or sheet-iron should be laid 7 or 8 in. below the surface to prevent the roots of the seedling gums from going down. The seed beds should be from 3 to 4 ft. wide, with a fine smooth surface. Water the bed before sowing. Sow broadcast, and spread some finely sifted loamy soil, light and dry, with a little decayed leaf mould mixed lightly and evenly over the seed; then water with a fine rose. A temporary screen over the beds will assist the seed and protect the plants.

If boxes are used they should be from 4 to 6 in. deep, with holes in the bottom for drainage. When filling the boxes, pots, or pans, place over the holes (for open drainage purposes) curved pieces of crocks or charcoal. Fill in with moderately-sifted loamy soil to within 1½ in. of



PINE TREES AND GUMS, TITANGA ESTATE, LISMORE—18 YEARS AFTER PLANTING.

the top; water, sow, and cover the seed as directed for the open beds. As plants in boxes are liable to be drawn, great care must be taken to keep them exposed to the light, and only shade when required. The seed will cost from 1s. 6d. to 2s. 6d. per ounce.

Sowing in Belts.—Where this can be done it is the cheapest and best. In rangy country, where there are steep slopes thickly dotted with tree stumps and outcrops of rock, and the surface is a tangle of roots, nursery growth must be planted. Where the soil is free from obstacles of this kind, seed planting can be proceeded with. The nature of the surface and sub-soil should be understood, as on this will depend the depth of the ploughing. A good shallow surface must not be buried or mixed out of proportion with a stiff clay sub-soil, that will run together in wet weather, and bake into a hard crust in summer. If the sub-soil is free, open, and porous, plough deeply, and work it up to a fine tilth.

Mix the gum seed with dry sandy loam, well sifted, and sow by hand broadcast out of a dish, seed bag, or box. Then pass a light harrow over

it. This done, the success of the crop will depend on the season. For this work May, August, and September months are the best. On the climate and district will depend the month selected for the work. As the trees advance in growth thin out, and allow them growing space. A mixed sowing should not be done unless the cultivator understands the nature and habit of the trees he is about to mix.

Fence off with a temporary dropper fence. The seed, cultivation, and fence will cost from £2 5s. to £3 5s. per acre, that is, when the planting is done along a permanent boundary fence.

Preparing the Ground and Planting.

Take out square holes 12 x 12 or 24 x 24 in. wide, and the same in depth; place the surface soil on one side of the hole, and the subsoil on the other. For shelter planting on exposed sites the holes should be 8 ft. apart; thin out as the trees grow. When the soil is pulverized, and not too wet or too dry, and the holes free of water, fill in by placing the soil as it was taken out. Should the subsoil be poor, mix a little surface soil with it. For planting select dull weather. Dry winds are injurious to plants out of the ground; avoid removing them. For planting it is better that two persons should be employed at the work. When root space is made in the centre of the filled-in hole by one man, the other can place the tree in its position from beneath a cover, and steady it while the fine earth is being filled in and pressed gently round.

Pines, Cypresses, &c., should be planted out in June or July, and not later than August. In warm districts, where frosts are not severe, gums (if properly hardened off) can also be planted. They will then be well established before the hot weather sets in. In cool districts, where frosts are severe, gums should not be set out until all danger is past. In lifting the gums for transplanting, great care must be taken not to injure or expose the roots. Allow as much earth as possible to remain on the roots; on gums every root is required. If reduced when transplanted into a new soil and position, the remaining roots will be unable to supply the stem and foliage with sufficient moisture. Hence, so many deaths, through the moisture passing away from the stem growth faster than the roots can supply the sap waste. Gums should be planted out in their permanent place when young and small, say, from 4 to 12 months old.

Great care should be taken to exclude all stock from the plantations. As rabbits do great injury to many of the seedling trees and plants wire netted fences will be a necessity in most localities.

Form of Entry for Tree Planting Competition.

Full address.......... ....

The Secretary for Lands,
Melbourne.

I hereby notify that I wish to be recorded as a competitor in the Tree-Planting Competition, in accordance with the published conditions.

Situation of property....... ....

Parish..................... ....

Area......... ....

Allotment..................... ....

Section......... ....

Full name of owner...... ....

Signature.................................... ....

Date. ... .

TO START FARMING.

II.—HINTS FOR BEGINNERS.

Wm. Gamble, Farm Superintendent, Dookie Agricultural College.

Among the hundreds of people now going on the land in Victoria under the Closer Settlement Scheme are many who have had no experience of farming under local conditions. This class will include all immigrants who take up blocks, as well as those of our own people who are taking up land for the first time.

The main difficulty for them will lie in deciding on the branch of farming that will suit them best. And this decision must be influenced by two main considerations:—First, the necessity of obtaining returns in the shortest time possible; and, second, that the amount of ready cash available for equipping the farm is, in most cases, strictly limited. Having decided on the branch to be followed, there remains the problem, "What is the irreducible minimum of expenditure on necessary live stock, plant, and improvements?"

The following notes are written in the hope that they may be of some service in assisting such beginners during the first three months.

The Choice of a Branch.

Farming may be divided into two classes:—(*a*) Dry farming; (*b*) Irrigation farming.

The latter class will be dealt with in these notes. Take for granted that the settler has £300 at his disposal, and that a block has been secured in an irrigation area, say, 50 acres, at £10 per acre. The freehold of this block may be obtained by 31½ annual payments of £30 each; this is equal to an annual rental of 12s. per acre.

There are several branches from which the settler may make a choice, *e.g.*,

1. Dairying, combined with pigs and poultry;
2. Growing cereals, for grain and hay;
3. Growing fruit for local and oversea markets;
4. Market gardening (including potato-growing and onion-growing);
5. Sheep for the production of export lambs and wool;
6. Wine making; raisin and currant production.

Of these branches, I consider that, for the average settler, dairying (with pigs and poultry) offers the best prospects. The climate and soil of Victoria are particularly well adapted for dairying, and the markets are assured. The export trade in butter is firmly established, it amounted to 25,000 tons for the 1910-11 season, and the London market can absorb any surplus of the local markets, so that the industry can be regarded as a permanent one. The settler who commences with small lots of live stock, and gradually increases them as means allow, cannot go very far wrong. Until the farm is well established, he should be constantly on the watch to *avoid incurring unnecessary expense.* He should look well ahead and cultivate a sufficient area to provide ample fodder for the stock, and should consume on the farm all the fodder he grows, turning it into butter, bacon, and eggs. He will find no more profitable method of disposing of his crops.

Improvements on the Farm.

Under the Crédit Foncier system, advances are made by the Lands Purchase Board for such improvements as out-buildings, grading, channelling,

&c. The amount borrowed may be repaid in half-yearly instalments at the rate of £4 15s. 7d. per cent. of the loan. This extinguishes the debt in fifteen years.

On taking possession, the first consideration will be a covering of some kind for the settler himself. If he be a married man, a house will be a necessity, but, while he is finding his feet, an unpretentious building should meet all requirements. For a single man, a tent will be sufficient and, if properly erected, may be made very comfortable.

Fencing and Out-buildings.

Fencing:—This will consist at first of a boundary fence, one subdivisional paddock, and yards.

Out-buildings:—A small stable for two horses and a milking shed of corrugated iron, with a solid floor.

Implements, Plant, &c.

The following equipment will be necessary to enable the settler to develop the farm properly:—

	£ s. d.	£ s. d.
Cultivation implements—		
Plough, one-furrow (or two-furrow, £8) ...	7 0 0	
Harrows, two-horse set lever	3 10 0	
Swinglebars, two-horse set	1 0 0	
		11 10 0
Harness—		
Two collars, £2; two backbands and chains, 15s.; two hames, 15s.; two winkers, 15s.; saddle and breeching, £3; plough lines and ropes, 5s.	...	7 10 0
Vehicle—		
Good secondhand dray (a spring dray and harness may often be obtained at a clearing sale for about £12)	...	16 0 0
Dairy utensils—		
30-gallon cream separator, cans, and buckets ...		25 0 0
Tools—		
Axe, 4s.; shovel, 3s. 6d.; pick, 2s. 6d.; sinking bar, 4s.; crosscut saw, 6s. 6d.; hand saw, 5s.; hammer, 2s. 6d.; brace and bit, 4s. 6d.; 2 files, 1s.; hoe, 2s.; rake, 2s.; nails (assorted), 5s.; wire strainer, 12s. 6d.	...	2 15 0
Seed and Manure—		
Lucerne, 112 lbs., at 1s.	5 12 0	
Oats, 20 bushels, at 2s. 6d.	2 10 0	
Superphosphate, 1 ton, at £5	5 0 0	
		13 2 0
Fodder—		
10 tons, for horse feed, at £1	...	10 0 0
Total	...	85 17 0

Live Stock.

Horses:—One heavy and one medium draught will be sufficient. If possible, obtain mares in foal.

Cows:—A fair start can be made with six cows heavy in calf or milking, and two heifers in calf. In the first year, obtain service of bull, by hire. The main consideration will be to get none but good stock. The poor man can least of all afford to keep inferior animals.

Pigs:—Start with four stores. Buy big-framed and well-developed animals. Condition need not be considered.

Poultry:—Twelve pullets and a second season male bird. Buy stock that show breeding and are derived from egg-laying strains.

Sheep:—If the season is at all good, grass should be plentiful. Additional cows would entail more labour. This would be avoided by stocking with sheep. Buy, say, twenty stores.

NOTE.—The running of sheep and cows together on the same land has serious disadvantages.—It is not recommended permanently. It is suggested in this case only because it appears to be the best way of turning surplus grass into money at a time when both labour and money are scarce.

CULTIVATION.

Putting in the Crop:—The first step in cultivation should be to plough a piece of land and sow oats for hay. Set aside a small area, say, 10 acres, and, in early autumn, sow with barley (Cape or Skinless) to provide green fodder. In spring, get in maize (Yellow Moruya or Hickory King) and amber cane (Early Amber Cane or Planter's Friend).

Next prepare the land for lucerne. Work it thoroughly so as to leave a seed bed of fine tilth. The seed may be sown in autumn (April and May) and spring (October). Sow 8 lbs. of seed and 56 lbs. of superphosphate per acre. Cover the seed not more than 1 inch deep. When the young plants are about 1½ inches above ground, harrow the surface two or three times to keep it loose.

After the Crop is in:—When the crops are sown, attend to fencing. Subdivide as soon as possible, but without incurring any heavy outlay.

When the settler has got thus far, he may start a small orchard, planting only such fruits as command a ready market at all times, *e.g.*, good export apples; apricots and figs for drying; oranges and lemons; raisins (Sultanas and Gordo Blancos) and Zante currants.

Good shade and ornamental trees also should be planted, such as Sugar Gums, Pepper Trees, Olives, Almonds, and Tagasaste.

EXPENDITURE.

The following is an estimate of the expenditure involved in the above suggestions:—

	£ s. d.	£ s. d.
Improvements—		
Fencing: Boundary, 90 chains, at £30 per mile	33 15 0	
Subdivision and yards, 30 chains, at £30 per mile	11 5 0	
Outbuildings: Temporary shed, with bush posts and straw covering, £5; milking shed, £10 ...	15 0 0	
		60 0 0
Implements, Plant, &c.—		
As per list		85 17 0
Live Stock—		
Horses: 1 heavy draught, £40; 1 medium do., £30	70 0 0	
Cows: 6 cows, at £7, £42; 2 heifers, at £4, £8 ...	50 0 0	
Pigs: 4 stores, at 16s.	3 4 0	
Poultry: 12 pullets and 1 second season male bird	3 0 0	
Sheep: 20 stores, at 8s.	8 0 0	
		134 4 0
Total		280 1 0

There is other expenditure that must not be overlooked, *e.g.*—

	£ s. d.
Irrigation water charge, at 5s. per acre foot, say	15 0 0
Shire rates	1 10 0
Payment of yearly instalment on land	30 0 0

Probably these items could stand over till after the first three months, in which case the unexpended portion of the settler's £300—£19 19s.—will be sufficient to cover cost of food and those unforeseen expenses that are unavoidable.

Returns.

Coming now to what will be, to most settlers, the most important consideration, we can estimate the gross returns at about £2 12s. per week, made up as follows:—

A good cow, properly fed, should average 3 gallons per day. At 4d. per gallon this will amount to 7s. per week, or for six cows, £2 per week, over the first six months of the milking period. In three months, the store pigs should be ready for the market as "fats," weighing about 130 lbs. At 5d. per lb. this would show a profit of, approximately, 10s. per week for the four pigs. The fowls should produce two dozen eggs per week, adding another 2s.

These returns can be increased by adding gradually to the stock and *providing plenty of nutritious food. The heifers, too, will be coming in* to swell the returns. If grass has been plentiful and sheep stocked, they should show a profit of, at least, 4s. per head, *i.e.*, £4 for twenty sheep. This could be expended in the purchase of another heifer.

Of course, the income shown above cannot be regarded as a princely one; but the settler who is prepared to move along quietly for a time, should be very well satisfied. He is "keeping the pot boiling," while he is all the time increasing his capital by increasing the value of his property. Apart from the financial aspect, the life is a healthy one and the settler is economically independent. The working day may at times be long; but with judicious management, this can be avoided without diminishing the income derived from the farm.

Conclusion.

It is essential that, in the course of time, the farmer should be up-to-date in his methods; breeding only good stock; making substantial improvements by further subdivision; erecting good farm buildings; making provision to conserve fodder; increasing the area under lucerne and other fodder crops; keeping himself well informed in connexion with improvements in machinery and appliances; and adopting those methods that will facilitate the economical working of his business.

If we look into the future, the prospects of the settler are not unalluring. He has established a comfortable home; and, apart from the living obtained in the meantime, he will have, as assets, his land and improvements, live stock, and plant, to show for the hard work of the earlier years. In addition, it may be estimated without exaggeration that, after a few years, from a 50-acre irrigation block developed on good lines and properly managed, there can be derived a net income of £400 per annum.

The farmer, in common with all men, is liable to strike unforeseen troubles. In the case of our settler, the loss of one or more horses or cows in the early stages would be a set-back; but with hard work and determination to overcome any difficulties that stand in the way, an enterprising and energetic settler will come out on top, making his little farm prolific and proving ultimately that, whether looked at from a financial, moral, or physical standpoint, he has made no mistake in adopting farming as a profession.

THE USE OF KAINIT AS A PLANT FOOD AND FUNGICIDE.

Alfred J. Ewart, D.Sc., Ph.D., F.L.S.; Government Botanist, and Professor of Botany and Plant Physiology in the Melbourne University.

Kainit is a natural mineral manure which has long been used in Agriculture as a potash manure, but which, according to recent work, has also other uses. In the pure form, the mineral was formerly supposed to consist of potassium sulphate, magnesium sulphate and magnesium chloride combined with six molecules of water ($K_2SO_4 . MgSO_4 . MgCl_2 . 6H_2O$). It seems more probable, however, that it really consists of potassium chloride and magnesium sulphate combined with six of water ($KCl, MgSO_4, 6H_2O$). It is usually, however, mixed with potassium chloride, rock salt and other impurities. The proportion of potash varies from 10 per cent. to 17 per cent., which is equivalent to about 18 per cent. to 30 per cent. of sulphate of potash. The amount of chlorine may be as high as from 28 per cent. to 50 per cent., although an average percentage is about 30. As a general rule, samples containing much chlorine are also rich in potash. To some extent the presence of salt is objectionable, particularly if the amount exceeds 30 per cent. For such a crop as mangolds, however, the presence of salt is actually an advantage, if not too abundant; but for many crops, as well as for flowers and fruit trees, the presence of salt in any amount may exercise a more or less pronounced injurious effect. In such cases where a supply of potassium is needed and cost is less important, simple potassium salts may be used, such as the sulphate or chloride; and, on a small scale, the more expensive nitrate.

The usual application is at the rate of 4 to 8 cwts. per acre; and, as a general rule, better results are obtained when it is applied to sandy, calcareous or humus soils, than when it is used on clays and loams. To get the best results the soil must contain a sufficiency of lime, and in pastures the effect is more noticeable on the quality than on the quantity of the herbage. Naturally, it would be little use applying it to a soil already sufficiently rich in potash, and this is best told by actual trial.

Crops which have specially high potash requirements are potatoes, mangolds and other root crops, carrots, onions, fruits and all kinds of leguminous crops, peas, beans, clover, &c. For grasses and cereals potash is usually less necessary, but recent experiments in the United States showed that the application of a mixture of phosphates and kainit quadrupled the yield of hay, as compared with long unmanured plots, and its use was found to result in the production of a greater yield of marketable potatoes than the application of any other form of potash. On the other hand, some experiments carried out in Germany showed that when kainit was applied to the soil in the form of a heavy dressing before or after planting, it appeared to exercise an unfavourable influence upon the development of the skin of potatoes, which would probably affect their keeping qualities and resistance to disease. Its use was not, however, found to produce any perceptible effect on the amount of potato scab. Experiments in the south of the United States showed that kainit was more costly as a fertilizer for cotton than chloride of potassium, whereas experiments in England, near Leeds, showed that the finest malting barley was

grown with a mixture of nitrate of soda, superphosphate and kainit. The use of kainit has also been found to increase the proportion of seed to straw in peas, beans, oats and rye.

It has also been claimed that kainit is useful both as an insecticide and as a fungicide. It is doubtful whether it has any sufficiently powerful action to be of any direct use, either as an insecticide or fungicide. It does, however, appear to render the plants to which it is applied more resistant to certain diseases; and, according to recent work, this effect is best shown when it is used in the form of a spray applied to the foliage. Applied to potatoes in the form of a 2 per cent. solution, it appeared to make them more resistant to leaf curl disease and to increase the yield without producing any pronounced decrease in the percentage of starch in the tubers. On the other hand, when applied to the soil in the usual manner, it had no perceptible effect on the disease of celery known as "Black Heart"; and, wherever it has been tried as a preventive for rust and smut, it appears to have been almost, if not entirely, a failure. This mineral has also been used to add to farmyard manure in order to preserve it and diminish the loss of nitrogen. It has not, however, been found to be particularly effective, and the addition of kainit to manure does not preserve it as well as does packing it closely and covering it with a layer of soil.

The practice sometimes followed of strewing kainit on the bedding of domestic animals is a bad one. It exercises an injurious action on their feet, and it has been found that, when swallowed, it is irritant or even toxic to chickens.

One curious action of kainit is worthy of note. It appears that, when applied to the soil in large amounts, it increases the conductive power of the soil for heat and hence keeps its temperature more uniform. Exactly how it acts is not quite certain, but the application of kainit at the rate of 100 to 300 lbs. per acre was found in Germany to reduce the formation of frost. When applied in still greater amounts, it forms a crust on the surface of the soil and appears to render it liable to a greater variation of temperature than before any was applied. These facts are of interest because they show how complicated may be the action of any manurial substance when applied to the soil.

Artificial Manures Act No. 2274, Section 14.

NOTICE TO MANUFACTURERS AND IMPORTERS OF ARTIFICIAL MANURES.

Applications for registration of brands of all manures which are intended for sale during the ensuing season should, with declarations and regulation fees, be lodged with the Secretary for Agriculture on or before the 1st November.

S. S. CAMERON,
Acting Secretary for Agriculture.

14th October, 1911.

FARM BLACKSMITHING.

(*Continued from page* 689.)

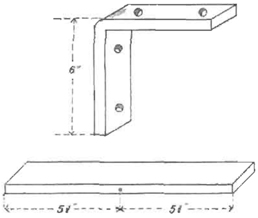
George Baxter, Instructor in Blacksmithing, Working Men's College, Melbourne.

FORGING—(*continued*).

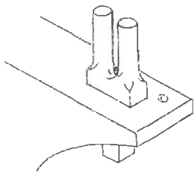
Bending Bars.

When it is desired to bend a piece of iron or steel at a given point, for instance, in the case of wall-brackets, pole-clips, &c., it is essential that the heat be confined to that part only. To do this in the fire alone would, in nearly all cases, be impossible, on account of the heated part being longer than necessary, due to the spreading of the fire and to the conductivity of the metal.

To obtain the correct length of heated iron to make a neat bend with a minimum of labour, the metal should be raised to bright red; and, after removal from the fire, taken to the cooling tub where it should be cooled off on each side of the mark, leaving the length of heat equal to about one and a half times the thickness of the bar.



31. BRACKET FOR SHELF.



32. FORK TOOL.

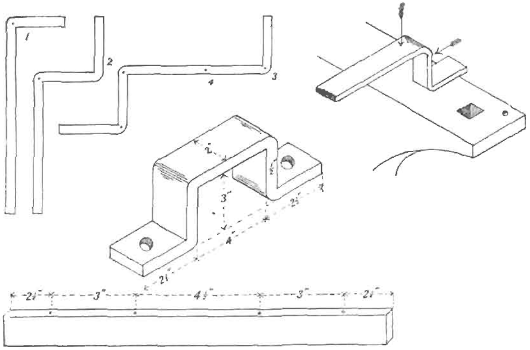
Fig. 31 shows a bracket for a shelf, where each arm is 6 in. long and the metal 1½ in. x ½ in. The iron should be cut off to the length, which in this case would be 11½ in.—the distance from each end to the centre of bend. The position of the bend is now marked with a centre punch and, after heating and cooling as stated above, it is quickly taken to the anvil and bent over the edge with a hammer; or it may be gripped in the vice and pulled to the angle required; or, instead of the vice, in a *fork tool* (Fig. 32).

In bending by this method, the success depends largely on quickness after leaving the fire. If the part which is to form the corner is allowed to get black it will not bend at the exact spot, and as such a small portion of the bar is left hot it is evident that it would soon cool out by the heat being conducted to the colder portion of the bar.

A *pole-clip* (Fig. 33) is a little more difficult to make on account of there being four bends, the position of each of which is important to the result. If one be made according to the dimensions shown on the sketch, the required size of iron would be 2 in. x ½ in.

The most methodical way of making is to first mark off on one end of the bar as shown (*a*). It will be noticed that the lengths used for marking off the bar are not the exact figures given on the drawing, it being necessary to change the figures so that the ultimate result will be correct. The measurements used are from the end to the centre of the first bend, and from the centre of the first to the centre of the second bends, and so on. When the bar is carefully marked off, and each corner marked on the edge of the bar with the centre punch, the piece should be cut off the bar with the cold-sett or hardee.

The corners should be worked in the order indicated by Nos. 1, 2, 3, and 4. It will be observed, by reference to the drawing, that the inside of the corners is made sharp and forms a right angle, and also that the outside of the corners is rounded. To obtain this result, it is nearly always necessary to re-heat and hammer up from the outside, because in bending the inside corner is curved, and the radius of the curve is governed by the length of the heated part. When hammering to shape it should be



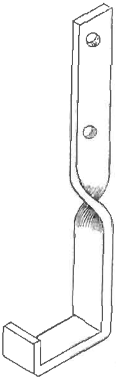
33. POLE CLIP.

placed on the anvil as shown at (*b*), and the blows struck in the direction indicated by the arrows.

A large number of blacksmiths persist in hammering the corners until they become square on the outside. This is a grave mistake as it weakens the bend. The hammering that is done after the inside becomes square tends to shear off the fibres of the bar. Although it might appeal to the eyes as being a better finished job, yet at the same time strength, which should always be the chief consideration, is sacrificed for appearance.

If an attempt be made to again straighten out a corner so finished, it will be found to be broken at least half way through the bar; therefore, it is reduced in strength by half. When it is necessary to have a square external corner, as it sometimes is in high class work, it is done by a different method. This need not, however, be described here, as it involves considerably more work; and, further, the simple method given is quite sufficient for the farmer's requirements.

Twisting.



34. Hanger.

Like bending, twisting can be performed at a red heat without causing loss of strength. Twisting is necessary in numerous cases; for instance, if a *hanger*, similar to that shown in Fig. 34, or a flat bar to be used as a *stay* (Fig. 35), requires to be made.

Very little description is requisite to enable one to twist a bar of iron. If the bar be flat like those illustrated, the position of the twist should be marked with the centre punch, heated and cooled similarly to when making a bend; with the slight difference that the length of heated part requires to be equal to the breadth of the bar. To twist round to the desired angle, one end may be held in the vice or the *fork-tool*, and the other turned around with a pair of tongs, or a *dog;* or two pairs of tongs may be used, one on each end.

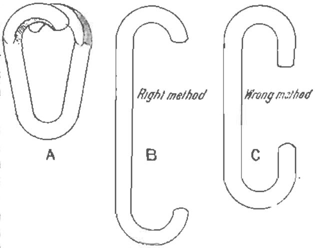
35. Stay.

Split Links.

A split link is one of the most useful articles that the farmer requires. It also affords a good exercise for a beginner at blacksmithing. The best way to make one is to cut off from a bar a piece of sufficient length. Then point each end wedge-shaped, and afterwards bend each end to a semicircular shape, as shown in Fig. 36*b*; finally bend in the centre.

To find the length to cut off before working in the fire, add the thickness of the iron to the inside breadth of the link and multiply the sum by $3\frac{1}{7}$. To the product add twice the difference between the inside length and inside breadth. This will give the neat measurement. To this amount something will need to be added to allow for wasting away in the fire, as well as for imperfections in working on the anvil.

To attempt to fix this amount definitely would be impossible, because a good quick workman would not waste as much as a slow or careless one. Consequently the best advice that can be given is:—Firstly, ascertain the amount by calculation that would be needed if no waste took place and the workmanship were perfect; secondly, follow the description given as closely as possible; thirdly, study the shape of the article. By so doing the careful and observant man will find out what allowance suits his own requirements. A good tradesman would only need to allow about $\frac{1}{8}$th of an inch for a link made of $\frac{3}{8}$-in. iron.

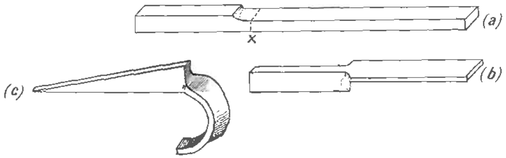


36. Split Link.

There is one mistake that perhaps ninety-nine out of every hundred make in their first attempt to do this job; they bend too much over at the ends, like that shown in Fig. 36*c*, and the consequence is that the link is shorter than intended.

Pipe Holdfasts.

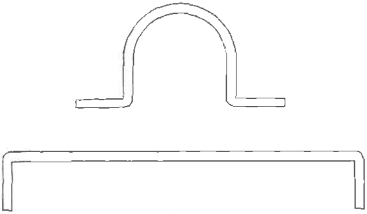
A *holdfast* is a good exercise at forging and it is also a very useful article. They are made in varying sizes to suit different sizes of pipe. It does not matter whether they are required to fasten gas, water, or drain pipes to the wall, the shape will be the same, but of course the length and strength will have to be determined by the maker. Fig. 37 shows the shape.



37. PIPE HOLDFAST.

For the sake of illustration, let it be supposed that it is necessary to make some to hold a down pipe from the roof guttering and that the pipe measures 2 in. diameter; then, if made to measurements given, they will be found to give satisfaction. About the most suitable material would be $\frac{1}{2}$ in. x $\frac{1}{4}$ in., but if that size be not available, then they could be made from $\frac{7}{16}$ in. or $\frac{1}{2}$ in. square iron, or $\frac{1}{2}$ in. or $\frac{5}{8}$ in. round. As $\frac{1}{2}$ in. x $\frac{1}{4}$ in. is not a usual stock size, $\frac{7}{16}$ in. square will be used in the following description.

Cut off a piece of the bar to a convenient length to hold in the hand, heat up one end to a white heat and hammer out on the anvil to $\frac{1}{2}$ in. x $\frac{1}{4}$ in. as shown at *a*. Next flatten out like *b*. It should then be cut off at + and the end pointed similarly to *c*. The opposite end is then heated and bent to suit the radius of the pipe.



38. HOLDFAST FOR HEAVY PIPES.

The most important point in making holdfasts is to have the driving shoulder made as square as possible. In driving, never strike the bent part; start by hitting the shoulder with the hammer and finally driving home with a punch held on the shoulder. This is easier than trying to drive all the way with the hammer alone.

Fig. 38 is another form of fastening for pipes, principally those of a heavier nature. It is not very difficult to make. Each end is bent to

right angles and finally in the centre. Finding the right length is about the most important part of the operation. By applying the formula given for finding the length of circles this should not be difficult. The dimensions of iron used will be determined by the size of pipe.

(To be continued.)

DAIRYING IN THE SOUTH GIPPSLAND HILL COUNTRY.

H. C. Churches, Dairy Supervisor.

Amongst farmers in the Northern Districts, more especially those whose attention is devoted chiefly to wheat-growing, the word Gippsland is almost synonymous with cows and abundance of green pastures. That this opinion is well founded, as far as South Gippsland is concerned, is borne out by the fact that in the Woorayl shire alone there are upwards of 16,000 dairy cows.

Without further explanation, it may appear to the reader that the whole of this district is given up entirely to dairying. That this is not so is easily proved by the vast numbers of fat cattle that are weekly forwarded to the Melbourne market. Then again, as the land is cleared, onion-growing and potato-growing are taken up with much enthusiasm. Dairying has, nevertheless, become the staple industry, for here, as is the case in most newly broken-up country, the cow is not only the settler's friend, but his most valuable asset. Great credit must be given the pioneer settlers, for it is entirely due to their indomitable pluck and perseverance that the conquest of this hilly country was made. As an instance of what has been done in this respect the farm of Mr. A. Lundstrum is a typical example.

This farm is situated on the Mirboo-road, a few miles north of Foster, and was selected by the present owner about 23 years ago. It comprises an area of 90 acres of typical Gippsland hill country. The timber on the place was chiefly blackbutt, blackwood, musk, and hazel scrub. When it is realized that many of the blackbutt trees were 300 feet in height, some idea of the labour involved in clearing may be obtained.

To-day, the whole of this farm is under grasses and clovers, and carries a herd of 24 dairy cows of high grade Jersey type, besides young stock. This dairy herd calls for more than passing comment. Mr. Lundstrum has evidently been an admirer of the Jersey for a number of years. By careful management, he has established a herd that he may well be proud. At the local annual show, under the Agricultural Society, his cow "Queenie" was successful last year in carrying off the first prize in the butter fat competition.

Some years ago, the Jersey was almost a despised breed in this rough country, but now there is quite a demand for Jersey blood. Generally speaking, this excellent dairy breed has the reputation of requiring to be pampered. It has, however, been proved that the Jersey, when bred here, can well hold its own in adverse conditions against all comers, and will respond more readily to favourable conditions. The herd under notice has been bred up from the ordinary crossbred cows, which were "picked up" anywhere to commence dairying. A pure Jersey bull has always been used, the one at present on the farm being of the Werribee Park strain. As each year adds its quota of heifers, most of the cows are young. Last year, although there were six two-year-olds in the herd, the return from cream alone realized only a trifle short of £9 per head.

In the early days of settlement, in fact, until recent years, the growing of fodder for cattle was almost impossible. The enormous amount of labour in clearing more than a small area, whilst the big trees were green, was far beyond the settler's power. Nature had to render assistance by the natural process of decay.

An area of 5 acres is now cultivated, its use being devoted to the growing of various fodders for the winter feeding of stock. Various legumes and root crops have been successfully grown; but oats for hay now form the main stand-by for winter feeding. Maize is also grown, but not extensively. On a farm where the grass and clover are green the year round, its value as a fodder is not so keenly appreciated as it is in other districts less favoured in this respect.

The winter in this district is severe, and consequently is the time when most attention must be given to hand-feeding. The general custom throughout the district has been to turn the cows out in winter and let them shift for themselves. Mr. Lundstrum had very reluctantly to do the same. He now points with pardonable pride to a fine stack of oaten hay, and to an enclosed cowshed of 24 bails, with a roomy loft filled with hay.

The milk is separated on the farm, the cream being conveyed on a sledge to the top of the ridge where it is picked up by the butter factory waggon. The skim-milk is used for fattening pigs which are as well looked after as the cows.

The water supply is from a never failing spring which forms a small permanent creek running past the orchard and cowshed. The idea is, later on, to harness this creek near its source, and have the water laid on to the premises.

Although much still remains to be accomplished before this property can compare with an up-to-date suburban dairy farm, a great deal has been done and has been done well. The owner is working on right lines, and his example may be followed by others with direct benefit to themselves and to the country.

EXTRACTING HONEY.

F. R. Beuhne, Bee Expert.

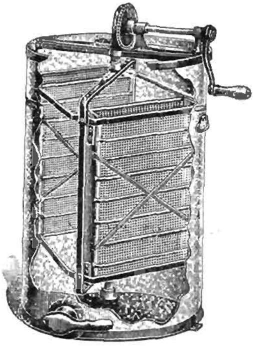
Extracting the honey from the combs will, in many districts, commence during November. It is in itself a simple enough operation, and is looked forward to with pleasure, particularly by the beginner, who sometimes takes it before it is ripe or ready for extracting.

Unripe honey is inferior in density and flavour, granulates sooner; and, when too thin and containing tannic acid, will even become very dark when it comes in contact with iron. Most Australian honeys contain tannic acid in traces; but, when properly ripe, the acid does not act on the iron of the tins. No general rule can be laid down as to when honey is ripe; it depends upon the source from which the bees gather the nectar and the degree of humidity of the atmosphere at time of storing by the bees.

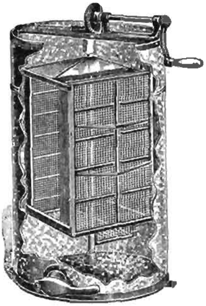
While honey from different plants varies considerably, when fully ripe, in the percentage of water it contains, ripe honey from one and the same source, but gathered in different localities, or even in the same locality but under different atmospheric conditions, will contain water in varying proportions.

During the summer months, in districts north of the Dividing Range which have a rainfall not exceeding 30 inches, honey is considered ripe when the combs have one-half to two-thirds of their surface capped over by the bees. In the country south of the Divide, and in districts with a heavy rainfall, it is better to leave the combs on the hives till nearly capped all over. This also applies to the northern districts during early spring and late autumn.

On the other hand, during very dry weather, honey may become over-dense and difficult to extract, even when not sealed. This sometimes occurs when a cold change, without rain, follows hot weather with a good honey flow. It is always best not to take off honey when the weather is cold, unless it is unavoidable. The combs must then be stored and the extracting done in a warm room.



COWAN 2-FRAME EXTRACTOR.



NOVICE EXTRACTOR.

Beginners often have difficulties through damaging the combs whilst in the extractor. This may result from several causes; the honey in the combs may have been too cold, the extractor may have been turned too fast at the start, the combs may have been too warm and soft, or the frames may not fit evenly against the wires of the extractor baskets.

Honey from the Red Box eucalypt is very dense, and it is almost impossible to extract it without damaging the combs once it has been allowed to become cold in the combs. In a lesser degree, this may also be said of Yellow Box honey. To extract dense honey, without damaging the combs, the extractor should be turned slowly till about half the honey of one side of the combs has left the cells; the combs are then reversed and the speed increased till that side of the combs has been emptied. Then the combs are again reversed and the honey left in the cells on the other side is thrown out.

Extracting combs should be straight, and present an even surface after being uncapped, so as to rest evenly against the wire screen of the extractor baskets.

When inserting uncapped combs into the extractor, or withdrawing empty ones, they should not be dragged along the wire screen or the cells will become burred, causing unnecessary work for the bees and preventing the honey coming completely away from the cells. This bruising of the cells will also occur in uncapping the combs when the honey-knife is blunt and the combs tough. An uncapping knife should be as sharp as a razor.

It should be borne in mind that the smaller the diameter of the extractor, the more likely are the combs to fracture; also, that a small extractor must be revolved faster than a larger one. The honey is thrown out of the cells by centrifugal force. As this acts from the centre, radiating in all directions, the further the combs are from the centre the less tearing strain there is on them and the less speed is required at the driving shaft.

In large apiaries, four-comb automatic reversible extractors are used in some instances, and are driven by motor power. For apiaries of up to 100 colonies of bees, the Cowan 2-frame reversible (Fig. 1) is, however, quite sufficient. The comb baskets are hinged, and when one side of the combs has been extracted, the machine is stopped and the baskets swung round by hand.

When only a few hives are kept, the Novice extractor (Fig. 2) will answer the requirements. In this, there are no comb-baskets; the uncapped combs are placed against the wire screen of the cage. To reverse the combs they must be lifted out of the extractor, turned, and put back. The difference in the price of the two machines is small, the Cowan 2-frame costing 10s. to 12s. 6d. more than the Novice. To any one commencing bee-keeping, with the intention of gradually increasing the number of hives, I would recommend that the 2-frame reversible be obtained in the first instance.

A SCALE INSECT DESTRUCTIVE TO CITRUS TREES.

Olive Scale (*Lecanium oleæ*, Bern.)

C. French, jun., Acting Government Entomologist.

The Olive Scale is one of the principal pests affecting citrus trees. It causes much damage and is liable to attack almost any kind of plant. Orange and lemon trees are sometimes smothered with the well known Sooty Mould, a fungus caused by the sugary secretion from the scale insects which closes the pores of the leaves.

Life History.

The colour of the covering of the young scales is light brown, sometimes yellowish, and when fully matured is a dark brown or almost black. The number of eggs laid by each female varies from 200 to 250; they are of a light yellow colour, the young insects being of the same colour. When fully matured, the female occupies almost all the space under the covering, but when she begins to deposit her eggs she becomes smaller and smaller until she withers completely away.

Parasites.

Fortunately, this scale is liable to the attacks of small parasitic wasps and other insects which destroy a great number of the eggs. When in the

caterpillar state, the Scale-Eating Moth (*Thalpocharis coccophaga*), is carnivorous, and destroys vast numbers of the scales. I have not seen the eggs of this useful moth, but Mr. Froggatt says—"They are laid among the foliage and branchlets of the infested tree, from which the tiny caterpillars emerge."

When fully grown and about to pupate, the caterpillars form a covering over themselves, consisting of pieces of the partly destroyed scales. They remain in the pupal state for some weeks, then emerge, and commence their

ORANGE BRANCH, SHOWING SCALES IN THE YOUNG AND ADULT STAGES.

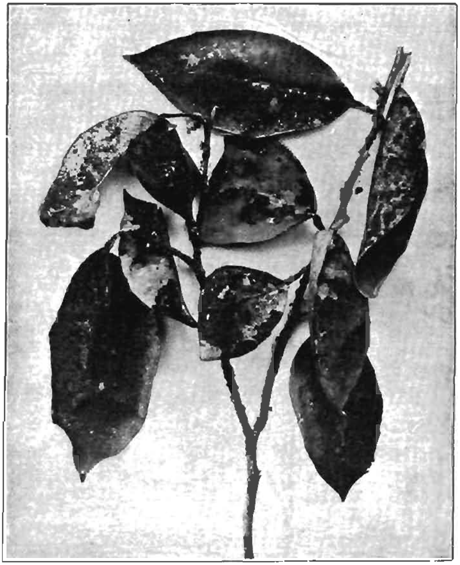
useful work. This moth attacks many other kind of scales, and is particularly abundant on the destructive Eucalyptus scale *Eriococcus coriaceus*, which is absolutely the worst scale infesting our timber trees, especially the Sugar Gums (*Eucalyptus corynocalyx*).

A small mite is often found in hundreds amongst partly destroyed eggs of this scale, but whether it is a parasite on the scale is not definitely settled.

The Frontal Shrike Tit (*Falcunculus frontatus*) is a great destroyer of this scale. I have often watched this fine bird busily engaged knocking off the coverings of the scales and devouring the young insects.

REMEDIES.

Red oil emulsion—1 in 45—has proved very effectual in destroying this and other scales. Several sprayings will probably be necessary. The formula for making red oil emulsion is as follows:—Boil 1 lb. of hard sliced up soap in a gallon of water till the soap is dissolved. Remove the vessel from the fire and add 2 gallons of oil to the boiling mixture. *Agitate violently for a few minutes with a syringe, or replace the vessel* on the fire and allow the mixture to boil again for five minutes.



ORANGE BRANCH, SHOWING SOOTY MOULD FUNGUS ON STEM AND LEAVES.

Red oil wash covers bark and insects more thoroughly than crude petroleum wash at the same strength. Winter treatment has been found to be most effective against such insects.

When the young scales are just hatched and are moving about the trees, kerosene emulsion will readily destroy them.

THE FRUIT EXPORT TRADE TO THE UNITED KINGDOM AND EUROPE.

REVIEW OF SEASON 1911.

Ernest Meeking, Inspector under the Commerce Act.

The outstanding features in this season's export have been as follow:—

1. The success which attended the *Somerset* shipment on a large scale of Williams' Bon Chrêtien and other pears.
2. The varying success, if the consignment named is excepted, which has attended shipments of pears for the season generally.
3. The probability of a profitable market for plums.
4. The early period at which the season opened and its continuance far beyond the usual time.
5. The large excess of total quantities exported over previous years.
6. The continued expansion of the German market.
7. The good prices realized on the German market.
8. The large number of trial shipments to new ports.

Pears.—The shipment by the *Somerset* constitutes an epoch in the oversea export of fresh fruit. Not only was the fruit landed in good condition, but the prices realized yielded a handsome profit to the pioneers who had the courage to embark in this venture. The success of this shipment may, undoubtedly, be attributed to three causes, *viz.*, (*a*) careful picking, packing, and handling; (*b*) the pre-cooling of the major portion of the cargo prior to shipment; (*c*) the maintenance of the shipment during transit at a low, even and proper temperature.

Careful attention to the above details is absolutely essential to insure success in the transport of fruit over long distances; and, although this has been repeatedly mentioned in the *Journal*, the liberty is hereby taken of restating this fact to exporters. Further, it has been pointed out time and again, and the statement is maintained, that fruits such as grapes, peaches, pears, plums, oranges, and even apricots and tomatoes, if carried under the conditions which were observed in connexion with the *Somerset* shipment, could almost, without exception, be landed on the oversea markets in good order. In fact, if proper up-to-date methods were adopted in picking, handling and transporting, the export of fresh fruits would continue practically throughout the year, instead of lasting, as at present, only about three months.

A glance at the appended list of prices obtained will show that the shipment of pears, for the season generally, has not been attended with any considerable success. In most instances, this may be attributed to the neglect of carrying out the conditions which were observed with regard to the *Somerset* shipment. The contrast between the condition in which the fruit comprising that shipment was landed, and the condition and prices respecting the pears shipped by other vessels, speaks for itself. The result shows that the small extra expenditure incurred in pre-cooling fruit prior to shipment and the carrying of fruit at proper temperatures, is more than justified, as the loss on even a small percentage of each consignment landed in bad condition amounts, in most instances, to more than such expenditure, besides injuring the reputation of the exporters.

Plums.—The price obtained for the small consignment of plums sent by the *Somerset* would appear to justify the shipment of this fruit on a

larger scale in the future. Plums may be shipped with as much safety as apples and pears, provided all the conditions mentioned in the preceding paragraphs are carried out.

Grapes.—One or two small shipments of grapes were made during the season; but the weather conditions were so exceptionally unfavourable for harvesting grapes that the fruit did not arrive in such good condition as it may have done during a normal season. The packing of the bunches in unsuitable cork dust also had a detrimental effect upon the keeping qualities of the fruit. The Agent-General reports that if grapes are carefully selected and packed in proper manner they may always be expected to bring good prices on the London market. A small shipment of twelve cases of the Doradillo and Waltham Cross varieties was sent to Vancouver last February and realized 20s. per case all round.

Quinces.—Small consignments of quinces brought excellent prices in London, and it would appear from advices that a fairly good market exists for this fruit in the United Kingdom.

Extension of Season.—During past years the first shipments have been carried by the P. and O. Company in the steamer which leaves during the last week in February. The 1911 season, however, opened a fortnight before the usual time and shipments were carried by the *Armadale*, *Somerset*, and *Orontes* before the *Macedonia* of the P. and O. line sailed on the 28th February.

The prices obtained for the shipments by the three boats mentioned were very satisfactory. This may be attributed to two causes, namely, the early arrival of the fruit on the markets when fruit was scarce; and the carriage of fruit at temperatures approaching more nearly the proper temperatures at which fruit should be carried; the temperature on the *Armadale* was 35 degs.; the *Somerset*, 30 degs.; and the *Orontes*, 35 to 38 degs.

The shipping of fruit much later than ordinarily has proved anything but a profitable venture. In many instances, it arrived in bad condition, and landed on markets glutted by soft fruits from the Continent and other places. In fact, some of the leading firms have been so impressed with the fallacy of forwarding shipments which arrive after the middle of June that they have issued notices warning shippers against repeating the experiment in the future. These notices state that, from the 15th April to the end of May, London may take large quantities of apples and pears; but from the time that strawberries and other soft fruits arrive on the market, prices drop immediately. A glance at the prices obtained for the *Mooltan* shipment (which has been selected as a representative late boat) confirms these statements.

Quantity.—The advance in the total quantities shipped for this season over previous seasons furnishes a record. The following are the figures for 1910 and 1911:—

1910 ...	162,144 cases	1911 ...	207,443 cases.

The use of cases manufactured from the native hardwoods is still on the increase. The quantities of each for the seasons 1909, 1910, and 1911 are as follow:—

Year.	Hardwood.	Softwood.
1909	71,550	115,020
1910	101,750	41,140
1911	239,988	57,456

German Market.—The German market has shown a marked expansion during the season under notice. This market is also remarkable for the all round good prices which have been obtained. The principal German port to which our fruits have hitherto been shipped has been Hamburg; but some of our exporters intend, next season, to open up direct shipment to Bremen. Some difference of opinion exists as to the advisability of direct shipment to the latter port. It is contended, on the one hand, that the buyers do not, at present, go to Bremen, and in all probability cannot be induced to do so. On the other hand, some exporters confidently state that this is not so; but that direct shipments to Bremen would find a ready sale. These advocates in favour of such direct shipment state, moreover, that Bremen is fully as good from a distributing point of view as Hamburg, having good communication with such cities as Berlin, Essen, Dusseldorf, Cologne, Frankfort, Mannheim, Hanover, Magdeberg, Leipsic and Dresden. This matter, of course must be left to the judgment of the shippers, and will, no doubt, be decided by the advices they may obtain.

Speaking generally, it may be conceded that the reason for the better prices obtained in Germany, over those of the United Kingdom, is due to the superior system of marketing which obtains in the former country. The spacious auction rooms in Hamburg give buyers opportunities to examine a far larger percentage of consignments than is possible in Covent Garden and other London markets. The general merits of our fruits have, therefore, a better chance of being displayed in Hamburg than they have in London. Speaking of the latter centre, it may be remarked that advices show that the prices obtained from private sales of fruit seem much better than those received from sales by public auction.

New Centres.—It seems a pity that better facilities do not exist for direct shipments to many large distributing centres in the United Kingdom and on the Continent. Many of these, such as Hull, Manchester, Glasgow, Bremen, Amsterdam, Copenhagen, Stockholm, and others cannot be reached except by transhipment, and the experience of exporters, who have tried to ship direct to clients in these centres, has not been of a nature to encourage a continuance of these ventures. This, in the opinion of the writer, constitutes a serious drawback to the expansion of the export trade. Those interested in this matter are recommended to read the very able report by Mr. R. V. Billis and published in the *Journal* of last March, on the possibilities of Manchester as a port to which our fruits may be shipped direct. This city and Hull seem to be the two ports which could be at present exploited with most advantage. It should be remembered that the latter port annually imports more than three times the value of the total value of fruits exported from Victoria, and that during the time our fruits arrive in the United Kingdom the population (numbering more than ten millions) of which Hull is the natural distributing centre, is dependent on London and Liverpool for its supplies of fruit.

During the season, several shipments were forwarded to ports hitherto untried, the most notable being Buenos Aires and Vancouver. Concerning both these places, recent advices state that large and profitable markets exist if facilities for reaching them were available. In May last, the Department of Agriculture shipped to the order of a leading firm in Vancouver 300 cases of carefully selected apples. Although no cool storage accommodation was available during the trip, and the consignment was shipped as ordinary cargo, the fruit arrived in good condition and brought

high prices. Shipping fruit on long voyages as ordinary cargo, however, is a practice which cannot be recommended as the probabilities are that 90 per cent. of shipments will land in bad condition.

A trial shipment of 189 cases of apples was sent to London during the season by the s.s. *Suevic*, and arrived at its destination in an unsaleable condition. The consignment was stowed on deck in horse boxes which were open at both ends so that a current of air was always passing through. The Agent-General's report on this shipment, after commenting on the unsatisfactory condition in which it arrived, concluded with these words, "As an experiment for stowing on deck, I would not advise a repetition."

It is hoped that, in the near future, cool storage accommodation for fruit will be installed on the boats trading between Vancouver and Australia. When such is available, shippers may confidently turn their attention to forwarding shipments to that port.

The following is a list of boats which sailed at different periods of the season together with a statement of temperatures at which the fruit was carried, and the highest, lowest and average prices obtained.

Per *Somerset* (Federal-Houlder-Shire line), sailed 13th February. Fruit sold in London, 29th March.

(Fruit arrived in first class condition, and met with a ready sale. This vessel brought a large quantity of Williams' Bon Chretien pears, which were of excellent quality. Temperature, 30 degrees.)

Variety of Fruit.	No. of Cases.	Prices Realized. Highest. s.	d.	Lowest. s.	d.	Average. s.	d.
APPLES.							
Alfriston ..	35	12	6	9	0	11	6
Annie Elisabeth ..	207	12	0	10	0	11	3
Chronical ..	9	11	0	11	0	11	0
Cleopatra ..	573	13	6	10	0	12	0
Cox's Orange Pippin	90	20	0	8	0	12	6
Dumelow's Seedling	109	15	6	10	0	11	0
Emperor Alexander	30	12	6	9	0	11	6
Gravenstein ..	136	14	0	9	0	12	0
Jonathan ..	910	15	6	10	0	13	6
Kentish Filbasket	73	11	6	9	6	11	0
King of the Pippins	20	14	6	12	6	13	6
London Pippin ..	197	11	0	9	0	10	0
Munroe's Favourite	181	14	0	9	0	12	0
Peasgood's Nonesuch ..	40	15	0	9	3	15	0
Prince Bismarck ..	6	11	0	10	0	10	6
Reinette de Canada	341	11	0	8	0	9	6
Ribston Pippin ..	161	14	6	8	9	11	6
Scarlet Pearmain ..	88	13	6	8	3	10	6
Tower of Glamis ..	13	11	0	11	0	11	0
PEARS.							
Beauty	2	11	0	11	0	11	0
Beurré Bosc ..	16	10	0	9	6	9	9
Beurré Capiaumont	59	13	0	9	9	11	0
Beurré Clairgeau ..	59	13	6	9	3	10	9
Beurré d'Anjou ..	72	14	0	10	0	12	9
Doyenné Bussoch ..	236	12	0	7	9	11	9
Howell	116	12	0	9	0	11	0
Napoleon ..	52	9	3	9	3	9	3
Vicar of Winkfield	49	11	6	11	6	11	6
Williams' Bon Chretien	3,832	19	0	9	9	13	0
PLUMS.							
Light plums (in cases containing 3 trays)	5	40	0	40	0	40	0

Per *Macedonia* (P. and O. Co), sailed 28th February. Fruit sold in London, 11th April.

(Fruit arrived in excellent condition, and met a ready market. Made good prices. The fruit was carried at a temperature of from 38 to 40 degrees.)

Variety of Fruit.	No. of Cases.	Prices Realized. Highest. s.	d.	Lowest. s.	d.	Average. s.	d.
APPLES.							
Adam's Pearmain	72	13	6	12	0	13	0
Alfriston ..	27	12	6	10	0	11	0
Annie Elisabeth ..	5	15	0	15	0	15	0
Cleopatra ..	750	14	6	12	6	13	6
Cox's Orange Pippin	79	19	0	13	0	15	0
Dumelow's Seedling	161	16	0	13	0	14	6
Emperor Alexander	42	12	6	12	0	12	3
Hoover	18	13	6	13	0	13	3
Jonathan ..	2,697	16	0	11	6	13	6
Kentish Filbasket	58	12	6	11	0	11	9
King of the Pippins	23	13	6	13	0	13	3
London Pippin ..	754	14	6	12	0	13	0
Munroe's Favourite	388	19	0	11	0	12	6
Purity	83	13	0	13	0	13	0
Reinette de Canada	263	13	6	10	0	11	6
Ribston Pippin ..	21	13	6	10	6	11	6
Rome Beauty ..	37	12	6	12	0	12	3
PEARS.							
Beurré Capiaumont	6	10	0	10	0	10	0
Beurré Easter ..	10	11	0	11	0	11	0
Vicar of Winkfield	164	10	6	9	0	10	0

Per *Barbarossa* (North German Lloyd), sailed 1st March. Fruit sold in Hamburg 20th April.

(Quality left much to be desired, fruit somewhat "spotty," and generally of poor appearance. Demand was extremely strong. Good prices obtained.)

Variety of Fruit.	No. of Cases.	Prices Realized. Highest. s.	d.	Lowest. s.	d.	Average. s.	d.
APPLES.							
Annie Elisabeth ..	9	14	9	14	9	14	9
Cleopatra ..	576	18	6	10	0	13	0
Cox's Orange Pippin	75	15	9	13	3	13	8
Dumelow's Seedling	111	15	0	10	0	12	8
Emperor ..	30	12	0	12	0	12	0
Jonathan ..	802	17	6	11	9	14	4
London Pippin ..	138	16	3	11	0	13	9
King of the Pippins	32	12	6	12	6	12	6
Munroe's Favourite	352	15	6	11	0	14	0
Reinette de Canada	575	18	0	7	9	11	5

Variety of Fruit.	No. of Cases.	Prices Realized.					
		Highest.		Lowest.		Average.	
		s.	d.	s.	d.	s.	d.
PEARS.							
Beurré Bosc ..	18	21	9	21	9	21	9
Napoleon ..	23	18	3	17	6	17	11
Vicar of Winkfield	78	19	3	12	0	15	1

Per *Rostock* (German-Australian Line), sailed 4th March. Fruit sold in Hamburg 25th April.

(Fruit arrived in good condition, and sold at good prices.)

APPLES.							
Adam's Pearmain	*5*	*15*	*0*	*15*	*0*	*15*	*0*
American Beauty ..	12	12	0	12	0	12	0
Annie Elisabeth ..	108	16	6	9	6	13	3
Ben Davis ..	5	10	6	10	6	10	6
Cleopatra ..	1,082	21	0	11	0	14	4
Cox's Orange Pippin	11	10	9	9	6	10	3
Dumelow's Seedling	35	12	6	11	0	12	1
Esopus Spitzenburgh	26	14	9	12	3	13	3
Gravenstein ..	2	11	6	11	6	11	6
Jonathan ..	703	16	9	10	6	13	10
London Pippin ..	128	14	3	11	0	12	3
Munroe's Favourite	616	16	6	9	0	12	4
Queen Caroline ..	24	17	9	17	0	17	6
Reinette de Canada	370	14	0	9	0	10	10
Ribston Pippin ..	25	9	9	8	0	8	9
Rome Beauty ..	5	11	6	10	3	11	0
Rymer	45	12	0	10	9	11	6
Willow Twig ..	47	13	3	13	0	13	1
PEARS.							
Beurré Clairgeau ..	66	19	0	15	0	15	11
Glou Morceau ..	51	20	3	16	9	16	11
Neverfail ..	5	20	6	20	6	20	6
Vicar of Winkfield	314	14	6	7	0	12	10

Per *Telamon* (Blue Funnel Line), sailed 7th March. Fruit sold in London 24th April.

(Apples arrived in fair condition, and of good colour. Some pears were over-ripe, and were condemned. Temperature, 38 to 42 degrees.)

APPLES.							
Adam's Pearmain	87	13	6	9	3	10	0
Alfriston ..	38	10	6	10	0	10	3
Annie Elisabeth ..	75	12	0	9	9	10	6
Cleopatra ..	637	13	6	10	6	11	0
Cox's *Orange Pippin*	*63*	*15*	*0*	*10*	*0*	*11*	*6*
Dumelow's Seedling	357	13	6	10	6	11	0
Esopus Spitzenburgh	6	11	0	8	9	9	6
Jonathan ..	2,698	14	6	9	0	10	6
King of the Pippins	10	11	0	11	0	11	0
London Pippin ..	681	12	6	9	6	10	6
Munroe's Favourite	325	12	6	9	3	10	6
Prince Bismarck ..	63	11	6	10	0	10	6
Reinette de Canada	1,374	11	0	9	0	10	0
Rome Beauty ..	138	12	0	10	0	10	6
Ribston Pippin ..	29	11	0	9	0	10	0
Rymer	*24*	*10*	*6*	*9*	*3*	*9*	*9*
Stone Pippin ..	15	10	6	10	6	10	6
PEARS.							
Beurré Clairgeau ..	24	12	6	6	0	8	0
Beurré d'Anjou ..	34	13	6	4	0	9	3
Josephine ..	103	14	6	10	6	13	0
Napoleon ..	9	8	3	4	0	5	0
Vicar of Winkfield	291	11	0	5	6	9	0
Winter Nelis ..	103	17	0	10	0	14	0
Half-cases.							
Vicar of Winkfield	88	7	9	4	0	5	3

Variety of Fruit.	No. of Cases.	Prices Realized.					
		Highest.		Lowest.		Average.	
		s.	d.	s.	d.	s.	d.

Per *Otranto* (Orient Co.), sailed 23rd March.

Fruit sold in London 2nd May.

(Condition of fruit not very satisfactory. Some pears were over-ripe. Temperature 35 to 40 degrees.)

APPLES.							
Ben Davis ..	*54*	*10*	*0*	*9*	*0*	*9*	*6*
Cleopatra ..	322	12	6	9	3	10	6
Dumelow's Seedling	6	11	0	11	0	11	0
Esopus Spitzenburgh	93	10	6	7	6	8	6
Jonathan ..	900	12	0	7	3	9	6
London Pippin ..	853	11	0	8	6	9	6
Munroe's Favourite	539	11	0	6	9	9	0
Pomme de Neige ..	33	11	0	10	0	10	6
Reinette de Canada	231	9	6	7	6	8	3
Ribston Pippin ..	9	9	6	9	6	9	6
Rome Beauty ..	564	10	6	9	0	9	6
Rymer	43	10	0	8	9	9	3
PEARS.							
Broompark ..	152	10	6	6	0	8	3
Josephine ..	80	10	6	5	0	6	0
L'Inconnue ..	97	11	0	8	6	9	6
Madame Cole ..	14	10	6	4	3	6	6
Vicar of Winkfield	114	10	6	3	0	6	0
Winter Nelis ..	116	17	0	5	9	9	6
GRAPES	19	9	0	5	6	8	0

Per *Orvieto* (Orient Co.), sailed 18th April.

Fruit sold in London 30th May.

(Fruit arrived in excellent condition, with the exception of some pears, which were over-ripe. Temperature, from 34 to 38 degrees.)

APPLES.							
Cleopatra ..	172	11	0	9	0	9	9
Dumelow's Seedling	42	10	6	8	6	9	6
Esopus Spitzenburgh	424	12	0	7	9	9	6
Exporter ..	301	10	6	10	0	10	3
Jonathan ..	403	11	6	8	6	10	0
London Pippin ..	974	10	0	6	0	8	6
Munroe's Favourite	484	10	6	8	3	9	3
Newton Pippin ..	223	12	6	10	0	11	0
Nickajack ..	18	9	9	9	9	9	9
Perfection ..	75	10	0	9	6	9	3
Pomme de Neige ..	8	10	6	10	6	10	6
Reinette de Canada	106	9	9	7	6	8	6
Rome Beauty ..	932	11	6	8	0	9	3
Rymer	264	10	6	8	6	9	3
Statesman ..	20	10	6	9	3	9	9
Stone Pippin ..	225	10	0	9	6	9	9
Sturmer Pippin ..	152	10	0	9	6	9	9
PEARS.							
Broompark ..	75	11	0	8	3	9	6
Josephine ..	45	20	0	11	0	15	0
Keiffer's Hybrid ..	12	16	9	5	6	6	0
Le Conte	44	12	6	11	0	11	6
L'Inconnue ..	52	14	0	10	6	12	3
Madam Cole ..	7	11	6	11	6	11	6
Winter Bergamot ..	37	11	6	10	6	11	0
Winter Nelis ..	65	20	0	9	0	15	3

Variety of Fruit.	No. of Cases.	Prices Realized.					
		Highest.		Lowest.		Average.	
		s.	d.	s.	d.	s.	d.
Per *Mooltan* (P. and O.), sailed 9th May. Fruit sold in London 19th June. (Fruit was landed in a fairly good condition. There was a glut of fruit on the market. Temperature from 38 to 40 degrees.)							
APPLES.							
Cleopatra ..	5	6	9	6	6	6	0
Dumelow's Seedling	21	7	0	6	3	6	6
Esopus Spitzenburgh	335	6	9	3	6	5	3
Hoover	183	5	3	3	6	4	3
London Pippin ..	674	6	6	2	0	5	6
Munroe's Favourite	501	6	3	4	9	5	6
Newton Pippin ..	413	7	6	5	0	6	3
Nickajack ..	113	7	3	5	3	5	9
APPLES—*continued.*							
Rokewood ..	104	6	9	5	6	6	0
Rome Beauty ..	2,048	7	0	2	6	5	8
Rymer	1 532	6	9	3	3	5	6
Statesman ..	51	7	0	4	6	6	0
Stone Pippin ..	497	6	9	3	6	6	3
Sturmer Pippin ..	751	7	0	4	3	5	9
Yates	202	7	6	5	9	6	6
PEARS.							
Broompark ..	30	7	3	6	0	6	3
Black Achan ..	12	5	6	5	0	5	3
Glou Moreeau ..	15	7	3	7	3	7	3
Le Conte	7	7	0	5	6	6	3
L'Inconnue ..	12	9	0	7	0	8	0

The above boats were selected as typical comparisons of those which might be made from the following different standpoints:—

1. As representing the principal shipping companies engaged in the oversea transport of fruit.

2. As showing the prices obtained at different periods of the season.

3. As affording a comparison between the prices obtained in the United Kingdom and Germany.

4. As indicating the probable effects which temperature maintained during transit may have upon the fruit.

Taking the season as a whole, it may be considered as satisfactory, although it has provided some surprises and prices have fluctuated in a rather remarkable manner. Reports just to hand show that, owing to the prolonged and abnormally hot summer, the "pip fruit" crop in Europe and America will not be nearly so heavy as was anticipated, and will yield only about 65 per cent. of a normal crop. In conclusion, the following needs of the trade may be summarized for the benefit of exporters:—

1. Provision for rapid cooling of fruit when picked.
2. Cool car transport.
3. Pre-cooling of all fruit prior to shipment.
4. The ocean carriage of fruit at temperatures between 30 and 32 degrees.
5. The installation of self-recording thermometers on fruit-carrying steamers
6. The provision of cool storage accommodation at London and other ports where transhipment is often required.
7. Improved methods of consignment, sale, and distribution of fruits.
8. The organization of the trade generally on the lines which have been adopted in California and Canada.

All these details will require attention and, to some extent, the expenditure of capital to bring into full effect; but means to insure their development must be undertaken and carried out if our marketing is to keep pace with our rapidly increasing production.

Fungus Diseases of the Potato in Australia.

The attention of readers of the *Journal* is drawn to the notice on page xxiii regarding Mr. D. McAlpine's latest work, "*Handbook of Fungus Diseases of the Potato in Australia and their Treatment.*"

PROSPECTS OF THE COMING FRUIT CROP.

P. J. Carmody, Chief Orchard Supervisor.

It is almost impossible at this early period to predict with any degree of accuracy the crop for the coming season, as most of the apple varieties, when the orchard supervisors collected their data, were in the florescent condition, nor had any of the stone fruits passed the critical stage—that of "stoning." A forecast, however, is extremely desirable to give exporters some idea of the fruit crop in general in order that they may book space in the boats for the export of their fruit, and in the event of their not being able, through miscalculation or otherwise, to fill the space allotted, they may know what districts to look to for supplying their wants.

In most districts, record yields were harvested last season, but it is not reasonable to expect anything like such returns per acre during the season at hand, as, no doubt, many of the blossoms now appearing are weak and incapable of setting their fruit.

It must be borne in mind, however, that the fruit-bearing area is annually increasing, so that even with a lighter proportional yield the ultimate crop should not be far short of that of the past year.

Apricots were exceptionally light last season as compared with the previous crop. To obviate this biennial habit as much as possible, growers when pruning should remove all weak, debilitated spurs, so as to induce the development of more robust and vigorous ones.

The prominent feature in the subjoined reports from the different supervisors is the promise of the Jonathan yield. This variety is so consistent under anything like fair treatment, that we feel surprised only when our trees are not bending down with their load.

Bendigo District.

Supervisor Cock reports:—

The fruit crop in the Bendigo and Northern District is one of splendid promise.

Apples.—Good, about two-thirds of last year. Munroe's Favourite, Rome Beauty, Jonathan, and Pomme de Niege look especially well, and so do most of the early varieties.

Apricots of all varieties have set a heavy crop in the Cohuna and Bendigo districts, and a good crop is also assured at Castlemaine.

Cherries will be fairly plentiful, about an equal crop to last year at Bendigo, but heavier in all varieties at Harcourt and Castlemaine.

Gooseberries, Currants, and Strawberries have set a good crop.

Grapes.—Should freedom from frosts be experienced, the grape crop should be a very heavy one. Vines everywhere are looking well.

Peaches.—A record yield in all varieties in all parts of the district is assured.

Pears give promise of a good average crop—from half to two-thirds of last year. Williams' Bon Chrêtien, and Josephine de Malines are somewhat light, but there is a good crop of Gansel's Bergamot, and Winter Nelis.

Plums.—Medium.

Tomatoes are well forward; the planting in the Bendigo district is not so large as last season, but the plants are flowering well. At Echuca, Swan Hill, and Kerang a good setting has already taken place.

Central District.

Supervisor Cole reports:—

Apples.—Light, medium, to heavy.
Apricots.—Light.
Cherries.—Light, medium, to heavy.
Gooseberries, Currants, &c.—Promising well.
Lemons.—Heavy.
Loquats.—Very light.
Peaches.—Light to medium.
Pears.—Light, medium, to heavy.
Plums.—Light to medium.
Quinces.—Medium.

Diamond Creek District.

Supervisor Wallis reports:—

Apples.—Most kinds have an abundant supply of bloom, Jonathan especially so.
Apricots.—Light.
Cherries.—Light.
Peaches.—As the result of frost on 18th September the crop in the orchards situated on creek flats, and even on hills of low altitude, has been almost totally destroyed. A good setting is assured in the orchards on higher situations and those under shelter of the Plenty Ranges.
Pears.—Early blooming varieties, such as Harrington's Victoria, Howell, and Kieffer's Hybrid also suffered badly from the effects of the frost. A light crop from these may therefore be expected. Later setting varieties, including Williams' Bon Chrètien, promise well.
Plums.—Light. Early bloomers were affected by frost.
Quinces.—Good.

Doncaster District.

Supervisor Hammond reports:—

Apples.—Very good, Jonathan particularly. London Pippin and Rome Beauty will also be heavy.
Apricots.—Very little grown. The prospects are good.
Cherries.—Good, providing the weather conditions are favourable.
Citrus Fruits.—Fair.
Peaches.—Good.
Pears.—Good. Williams' Bon Chrêtien, Keiffer's Hybrid, Beurré Capiaumont, and other leading varieties promise a fair crop.
Plums.—Light.
Quinces.—Good.

Evelyn District.

Supervisor Farrell reports:—

Bayswater.—Apples: Jonathan heavy; other varieties, a good crop. Pears: fairly heavy. Plums: medium. Cherries: heavy.
Blackburn.—Apples: Jonathan heavy; other varieties, a good crop. Pears, peaches, and cherries: heavy. Plums: Angelina Burdett, light; others, medium. Apricots: light.
Burwood.—Apples: fairly heavy, particularly Jonathan. Pears: Williams' Bon Chrètien, light; other varieties, a good crop. Plums: medium. Cherries: fairly heavy.
Croydon.—Apples: all varieties fairly heavy. Pears, plums, and cherries: medium.
Fern Tree Gully.—Apples: Jonathan, heavy; other varieties, a fairly good crop. Pears: heavy. Plums: medium.
Ringwood.—Apples: Jonathan, Rome Beauty, and London Pippin, heavy; other varieties, medium. Pears: Williams' Bon Chrêtien, medium; Keiffer's Hybrid, light; other varieties, a fair crop. Plums: medium. Cherries: heavy.
Scoresby.—Apples: heavy. Pears: fairly heavy. Plums: medium. Cherries: heavy. Peaches, heavy.
Vermont.—Apples: heavy. Pears: medium. Plums: Angelina Burdett and Green-gage, light; others, medium.
Wandin.—Apples: fairly heavy. Pears, plums, peaches, and cherries: light. Lemons and oranges: light. Passion fruit: very Light. Raspberries: fair. Gooseberries, strawberries, loganberries, and blackberries: good.
Waverley.—Apples: heavy. Pears, plums, and cherries: medium

Gippsland District.

Supervisor Pilloud reports:—

Bairnsdale.—Apples: good. Pears: medium. Peaches: medium, some varieties heavy. Apricots: fair.
Beaconsfield.—Apples: promising. Pears: medium. Cherries: very little now grown. Plums: little grown.

Pakenham.—Apples : good. Pears : fair. Other fruits not grown to any extent.

Warragul.—Apples : medium ; London Pippin, probably light, but too early to predict definitely. Plums and cherries : medium. Peaches : good.

Apricots, plums, and cherries are not entensively grown throughout Gippsland, where apples, pears, and peaches are the favourite fruits in cultivation.

Goulburn Valley and North-Eastern District.

Supervisor McCalman reports :—

Apples.—Medium. Nearly all the varieties showed plentiful bloom or bloom buds, Jonathan and Cleopatra being generally lighter than most.

Apricots.—Good, especially Moorpark, Oullin's Early Peach, and Royal.

Cherries.—Good.

Peaches.—Good. The early varieties, Briggs' Red May and Hale's Early, are plentiful.

Pears.—Medium. Williams' Bon Chrêtien, the principal variety grown in the district, gives promise of a good crop.

Plums.—Light.

Maryborough District.

Supervisor Chalmers reports :—

The prospects of the coming fruit season are excellent.

Amphitheatre.—Apples : heavy.

Horsham.—Peaches : very heavy. Apricots : early varieties, very heavy ; later, lighter. Pears : very heavy, excepting Vicar of Winkfield. Apples : blooming profusely.

Maryborough.—Apricots affected by frost on 18th September ; other fruits, very heavy.

Pomonal.—Apples : heavy.

St. Arnaud, Dunolly, and Bet Bet.—All fruits exceptionally heavy, excepting where early spraying for green aphis on peaches was neglected.

Mornington District.

Supervisor Meeking reports :—

Apples.—Heavy, particularly Jonathan.

Apricots.—Moorpark and Oullin's Early Peach, medium to heavy.

Pears.—Some varieties light, but Williams' Bon Chrêtien promises to be quite up to the average. Keiffer's Hybrid should also be good.

Plums.—Most varieties fair to medium. Burbank promises to be heavy.

Strawberries.—Average.

Western District.

Supervisor Davey reports :—

Freshwater Creek.—Apples : excellent. Apricots, peaches, and plums : very heavy. Cherries : good. Pears : medium.

Geelong.—All fruits promise well ; apricots have set enormous crops. Cherries also promise heavy crops.

Inverleigh.—Apricots : heavy. Apples and other fruits : excellent. Heavy crops of Jonathan are promised.

Mt. Cole.—Apples and pears : heavy. Cherries and plums : good. Apricots : fair.

Panmure.—Apricots : heavy. Peaches ard plums : good. Apples and pears : excellent. Jonathan, Esopus Spitzenburgh, and Perfection promise very heavy crops.

Pennyroyal and Forrest Line.—Raspberries : heavy.

Portland.—The prospects for both pip and stone fruits were never better than they are this season.

Rokewood Junction.—Apples, pears, cherries, and plums : heavy. Apricots : fair.

Teesdale.—Apricots : heavy. Apples : heavy, with the exception of Stone Pippin and Munroe's Favourite. Pears, cherries, peaches, and plums : good.

Timboon.—Apples : heavy, especially Jonathan, Sturmer Pippin, and London Pippin. Pears : light.

Warncoort.—Apricots : heavy. Apples : heavy, Jonathan especially.

PROPAGATION OF FRUIT TREES.

(*Continued from page 663.*)

C. F. Cole, Orchard Supervisor.

Grafting.

Although grafting is a very old method of propagation, it is still largely practised and is likely to be. Its value as a means of testing the utility of new seedlings and varieties, whether for stock purposes or resistance to disease, must be recognized amongst propagators as one of, if not, the greatest of crafts practised in Horticulture. For example, the hybridizer is enabled to prove or disprove within a few years from sowing whether a seedling is of any value, commercially or otherwise; also, it can be ascertained whether a new variety is suitable to any particular soil or climate. As a general rule, seedlings take many years before they become fruitful; but, by working a scion of, say, a seedling pear upon a quince tree, using a terminal branch, it will soon become fruitful.

Budding is superior to grafting only in this respect that it enables one to perpetuate more quickly a greater quantity from a given variety. A scion carrying four wood buds, if used in grafting, produces one tree; but, by resorting to budding, it is possible to raise four distinct trees. Since the well known Jonathan apple was introduced to Victoria from the United States, where it is known under the names of King Philip and Philip Rick, hundreds of thousands of trees of this variety have been propagated from a single bud or scion, chiefly by budding.

Grafting has, however, many merits that give it preference over budding when practised upon certain kinds and varieties of fruits to gain a desired result. The manual operation of grafting is not so easily performed as that of budding. It requires more vigour and skill when making the cuts. Yet, with practice and a suitable knife, (Fig. 1), it is easily accomplished. There are many methods of grafting in vogue, but only two will be dealt with, viz., whip-tongue, and bark for practising in the field. Even with these two methods, the manner of making the cuts upon the stock and scion differs somewhat. This is controlled by the parts to be operated upon. Each method will be described in detail so as to enable the operator to obtain the best results.

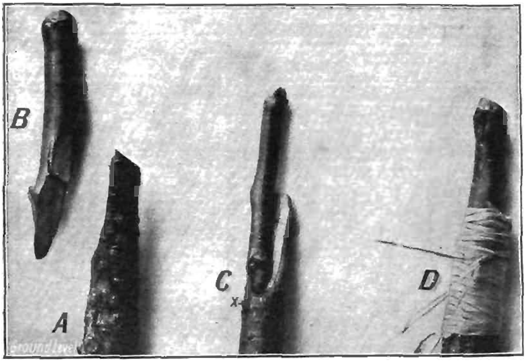
Ground Grafting.

Ground grafting may be practised in cases where the inserted buds have failed to unite with the stocks, through injury or other causes, and after cutting off is finished, *i.e.*, heading or reducing the stocks back to the united buds. If the grafting is done when the sap is starting to rise in the stocks it gives the propagator a second chance of producing a yearling tree, equally as fast as one from a bud inserted in the previous summer.

The operator should first provide himself with a whetstone, a strop for his knives, a folded wheat sack for use as a kneeling pad, a supply of prepared raffia, and a small shallow box to hold the stone and knives, and also the scions which should be previously cut into the required lengths. It is advisable to have two knives; one for doing the rough cutting, *i.e.*, reducing the stocks ready for grafting.

To do this, take hold of the stock by the top with one hand, and with the other place the knife in position. Then bend the stock slightly towards

the body, at the same time making a clean upward cut about 2 in. in length and quarter the way through the stock. Deftly turn the blade of the knife, and sever with a clean cut the same as when cutting off a budded stock. If the stocks to be operated upon are small or medium sized, this upward cut may be made right through from one side to the other—the same as the downward cut upon the scion. If the latter cut is practised upon a well grown stock, the scion when placed in position will be somewhat oblique, particularly if the cut is made short. But, if cut like Fig. 38, it will be in a perfectly vertical position. Having roughly made the cut upon the stock, pare away the cut until it has a smooth, level surface. Then back off the terminal end of the stock, leaving a short sloping cut. This should be made upwards, as shown in Fig. 38. The reason for making the short cut at the back of the stock is to prevent any moisture, when it is moulded up with earth, following down the scion



38. GROUND GRAFTING—WHIP-TONGUE METHOD.

a and *b* Stock and scion properly cut. *c*. United ready for binding. *d*. Bound ready for moulding.

and interfering with the woody matter that forms the callus and unites the scion and stock.

When making the tongue upon the stock, press the blade of the knife downwards and close to the terminal end of the stock (Fig. 38), and upwards in the scion. This tongue will hold the stock and scion firmly together until bound.

When selecting cuttings for making scions, see that they carry healthy wood and not bloom buds. Scions for ground grafting should not be cut long; two buds above the united parts will be ample (Fig. 38, *b*, *c*, *d*).

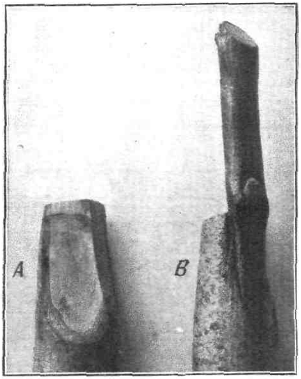
When the stock and scion are prepared, place the latter in position, and exercise care in seeing that the cambium of the scion fits exactly that of the stock upon the one side (Fig. 38 *c*). When placed in position, the lower end of the scion should not overlap the cut upon the stock. If so, an ugly join will be the result.

After the scion is properly fixed start binding below the union where marked thus x. Work upwards, and see that the union is well covered; firmly bind and finish off as shown in Fig 38 *d*. The scions may be small, but not larger than the stock to be operated upon, Cut the scions, if possible, so as to leave a bud near the bottom (Fig. 38 *b*, *c*), and also a bud near the top of the stock (Fig. 38 *a*). Such buds attract the rising sap and greatly facilitate union taking place.

Ground Grafting Large Stocks.

When whip-tongue grafting large stocks in the nursery rows, one side of the stock opposite to that upon which the scion is placed should be cut away. Make this cut the same as that for placing the scion upon, but not so far down the stock (Fig. 39 *a*).

The advantage of treating such stocks in this manner is that the growth of the scion will cover over the face of the cut upon the stock during the first season, whilst the expansion from the cambium at the side cut will callus over, making a neat and perfect union.



39. GROUND GRAFTING LARGE STOCKS.
a. Stock ready for scion. *b*. Scion in position and ready for binding.

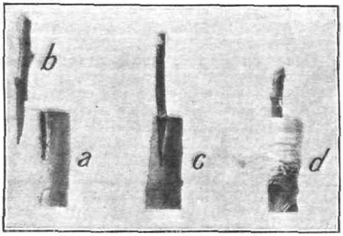
Bark Grafting Methods.

Another way of treating large stocks is to bark graft them. This operation may be performed in two ways.

The first method is to cut the stock close to the ground and straight across, using a small saw (Fig. 40 *a*). Then pare the cut neatly, and press the blade of the knife through the bark to the cambium, making a vertical incision about 1 in. in length.

Prepare the scion the same as in whip-tongue method; then make a straight inward cut at the upper end of the sloping cut upon the scion and three-quarters of the way through. Now pare down, making a smooth level surface and thus forming a heel (Fig. 40 *b*). Gently raise the bark upon each side and at the upper end of the incision made in the stock, and insert the lower end of the prepared scion. Gently force the latter between the bark and wood until the heel upon the scion is resting upon the level top of the stock when it will be in position and ready for binding (Fig. 40 *c*). Bind firmly and well. The advantage of cutting the scion with a heel is that the expansion of the scion across the top of the stock is quicker than when cut without.

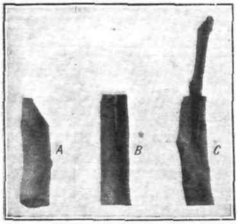
When bark grafting, do not select large scions; if so, the part to be inserted will have to be pared well down, so as to bring the cambium upon the scion in direct contact with that of the stock. In whip-tongue grafting, the scion rests upon a level surface and the cambium upon the one outer edge of stock and scion, being in direct contact, if placed correctly



40. BARK GRAFTING METHODS.
a. Stock prepared for scion. *b.* Scion. *c.* Scion inserted in stock and ready for binding. *d.* Bound ready for moulding.

together. On the other hand, in bark grafting, that portion of the stock upon which the scion rests, and where unity takes place, is somewhat rounded. Bark grafting can only be carried out when the bark lifts readily upon the stocks. This is when the sap is flowing freely.

The *second method* of bark grafting is performed by treating the stock somewhat similarly to the whip-tongue method, the sloping cut through the stock being made shorter (Fig. 41 *a*). The scion is cut the same as in the whip-tongue method and forced down between the bark and stock. This method renders the tying somewhat difficult, owing to the raffia slipping upon the slanting cut. After the scion is inserted, nick the top portion of the raised bark of the stock upon each side of the scion, *i.e.*, if the bark upon the stock is thick. This will allow the bark when binding to close well down to the stock again.

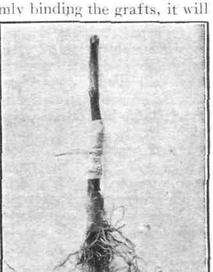


41. BARK GRAFTING METHOD.
a. Prepared stock, side view. *b.* Front view. *c.* Scion inserted and ready for binding.

MOULDING GROUND GRAFTS.

After firmly binding the grafts, it will be necessary to mould them up with well pulverized earth. This operation will require care in seeing that no lumps of earth, &c., strike against the scions and misplace them. Sufficient soil should be placed upon each side to cover the graft well above the union. Tread the soil firmly with the flat of the foot and press well about the scions with the hands to expel any air. To be successful when moulding or binding a graft, it should be remembered that however well cut and joined, the air and excessive moisture must be kept away from the callusing parts. Do not skimp the soil when moulding. If so, the first heavy rain will wash the soil away from the grafts. Be careful not to knock out any buds upon the scions.

Do not place the scions upon the stocks below ground level as they are apt to shoot roots. With most of the fruits in general cultivation this must be avoided. When union has thoroughly taken place and the callus hardened, the soil should be removed



42. WHIP-TONGUE METHOD.
Bench grafted stock ready for planting.

about the grafts, thus preventing the scions from rooting. The planter should never plant trees below the graft or bud, but keep these parts well above ground level.

When practising the ground method of grafting upon the apple, it is better to bind with waxed paper or calico. Grafts bound with raffia, and properly moulded with earth, will not require attention as far as the binding, cutting into the expanding stock, and scion are concerned.

Grafting stone fruits should be carried out much earlier than seed. The end of July or early August is the best time. Cuttings should not be used for scions if the buds have started to break. The stocks may be in leaf but the scions must be dormant. When heeling in cuttings for grafting purposes, make a fresh cut at the apex end and press them well down in the soil until they rest upon a firm bottom so as to encourage callusing. Cuttings so treated may be lifted and buried in moist sand or soil to keep them back for late grafting.

When bench grafting rooted stocks, they should be planted out when finished, and moulded, *i.e.*, if bound with raffia. This treatment does not apply to vines which are first placed in a callusing box. The writer's practice, when grafting vines in the field, was to keep the cuttings well back until the stocks to be grafted were out in leaf. Bleeding is not so severe at this period as when the buds are first moving.

(To be continued).

ORCHARD AND GARDEN NOTES.

E. E. Pescott, Principal, Horticultural School, Burnley.

The Orchard.

Pests.

As a preventive against codlin moth, the trees should be kept well sprayed with arsenate of lead. It has been definitely ascertained that this is the best remedy and all other mixtures should be discarded in its favour. Its permanent qualities, combined with an effective killing strength, render this mixture invaluable; at the same time, it is easily mixed, and so very few brands leave any sediment, that the work of spraying is now reduced to a minimum.

If the spraying is careful and thorough, no bandaging need be carried out. The time spent in bandaging will be far better employed in an extra spraying. The first spraying should have been given at the time of the falling of the petals; the second spraying, owing to the rapid expansion of the fruit, should be given a fortnight later. After that, the grower must use his own judgment as to the necessity for subsequent sprayings. If the moths be at all prevalent, other sprayings will be quickly necessary.

For the cherry slug, arsenate of lead may be used, except where the cherries are approaching ripeness; hellebore, lime, or tobacco water should then be used.

Cultivation.

The work of ploughing and harrowing should be completed immediately. The frequent rains have rendered cultivation easy, and there should be no difficulty in carrying out this work at once. It is always advisable to have the land well tilled before the dry weather sets in.

All crops for green manure should be now under cover; and, if the orchard soil is at all heavy or sticky, the grower should make up his mind to grow a cover crop next season in order that this condition may be reduced.

The orchard should be kept free from weeds, not only for the conservation of moisture, but in order to do away with all hiding places of the Rutherglen fly, cut worm moths, &c.

General Work.

Grafted and newly planted trees should be frequently examined, and given an occasional watering and overhead spraying, in order to encourage their growth and to prevent loss of moisture from the foliage. It is also advisable to mulch young trees with light grass or straw mulching, not too rich in animal manure.

The disbudding of unnecessary shoots, and the pinching back or stopping of growths, to prevent them being unduly prolonged, may now be carried out. This work is particularly important on young trees.

Graft ties should be examined, and the ties cut wherever any growth is being made. Where the grafts are likely to make any long growth, they should be well staked and tied.

Citrus trees may be planted out, watering and mulching them after planting.

Vegetable Garden.

Celery may now be sown for winter crops. French beans should be largely sown. Cucumber, melon, pumpkin, and all seeds of this family may now be sown in the open. Where these plants are already growing, the longest and strongest runners may be pinched back, to throw the strength into the flowering and lateral growths. Watch these plants for mildew, and use the sulphur freely wherever present, especially on the young plants.

Peas, lettuce, radish, turnip, cabbage, and sweet corn seeds may be sown this month. Seedlings from former sowings may be planted out, and it may be well to dip the whole plant in water before planting. This greatly assists the young plant while taking hold of the soil in its new location.

Frequent waterings and frequent cultivation will now be necessary, and all weeds must be hoed or hand weeded out; mulching with stable manure will greatly assist the plants.

A few beds should now be deeply worked, adding a liberal dressing of stable manure. These plots will be then ready for the celery, cabbage, and other seeds planted during this month.

Tomato plants will now require constant attention, watering, staking, thinning and pinching back the laterals.

Flower Garden.

Continue to plant out various bedding and foliage plants, corms of gladioli, and seeds of such tender annuals as phlox drummondi, balsam, zinnia, nasturtium, celosia, aster, cosmos, and portulaca.

While seeds germinate and grow fairly well planted out in the open, it is more advisable during the summer months to plant them in sheltered seed beds, or in a canvas or calico frame. The protection need only be on the one side, preferably the west or north-west; the seedlings are then

protected during the hottest portion of the day. At the same time, the shading is not sufficient to unduly "draw" them.

The seeds should not be deeply sown, and all waterings should be light. A little water and often should be the rule for seedlings. Annuals should be given plenty of room when planted out in the garden. Being quick growers, they are generally gross feeders, and they must have room to develop a good root system. Feeding, too, with liquid manure is helpful when they are reaching the flowering stage.

Dahlias should now be planted out, either from tubers or from young rooted cuttings. These will give good summer blooms. For autumn and show blooms, the planting should be deferred until the middle of December.

Herbaceous and succulent plants should be staked for their protection; included in this section are delphinium, gladioli, perennial phlox, rudbeckia, &c. These plants will all benefit from liberal mulchings and watering with liquid manure when approaching the blooming period.

Spring flowering bulbs, corms, and tubers should now be all lifted and stored.

The soil surfaces will now benefit from frequent hoeings and stirrings. Constant waterings will be required if the weather be hot or windy; the cultivation should quickly follow the waterings in order that the moisture may be thoroughly conserved. Mulching with stable manure is also beneficial at this season.

GREEK CURRANTS.

F. de Castella, Government Viticulturist.

The vineyards planted with the Zante currant in the Commonwealth, especially in the States of Victoria and South Australia, are steadily increasing in extent, with the result that the annual yield of currants is gradually overtaking the demand; in fact, but for the heavy rains of last autumn, which were responsible for much loss, our last currant crop would have sufficed for Australian requirements. Large areas, already planted, are not yet in bearing, and nothing seems more certain than production in excess of Commonwealth requirements within a very near future.

The problem of how best to deal with the surplus is one which will shortly have to be faced. Exportation naturally suggests itself, but in this direction the outlook is far from satisfactory. There is no hope of obtaining, on the markets of the world, more than a fraction of the prices now ruling locally. Greece, the country which has so far supplied the world, has not only found it necessary to prohibit further plantation, but has adopted the even more drastic expedient of compensated eradication in order to curtail production. All this is in striking contrast to our increasing areas, and it is well that intending planters should be in a position to know what they can reasonably expect from exportation.

The *Public Ledger* (London) of 25th August, 1911, reproduces an article from Messrs. Burlumi's Annual Report, in which the actual state of the currant market is dealt with at considerable length. Greek currants are, naturally, the only ones dealt with, the entire currant supply coming from that country; no other part of the world appears as yet to produce currants, except Australia, which still consumes rather more than she produces. From the article the following notes are extracted.

The current year closes on 22nd August. The shipments from Greece for the years closing on that date in 1910 and 1911 respectively were as follow :—

Exported to—	1909–10. (Vintage 1909).	1910–11. (Vintage 1910).
	tons.	tons.
United Kingdom and Australia ...	68,700	65,000
United States and Canada	16,500	14,500
Continent of Europe	34,800	35,000
	120,000	114,500

Making allowances for fruit carried over to the following season and old fruit brought over from the previous one, the crop of 1910 was 123,000 tons as against 185,000 in 1909, and 185,000 in 1908.

The currant season of 1910-11 opened in the United Kingdom on 13th September, 1910. The quality was, in general, all that could be desired. No finer crop had been gathered since the year 1901. This was largely attributed to the fact that the Act ratifying the convention between the Greek Government and the Privileged Company imposes pains and penalties upon growers offering for sale immature and insufficiently dried fruit, and empowers the Customs authorities to prohibit the shipment of such fruit. The opening prices, per cwt., duty paid, were as follow :—

Vostizza	... 38s. to 42s., and up to 50s.
Gulf, including Panariti ...	... 34s. to 43s.
Patras	... 33s. to 38s.
Amalias	... 28s. to 32s.
Pyrgos and Provincial ...	... 26s. 9d. to 27s. 6d.
Smalls	... 30s. to 38s.

For comparison purposes Australian fruit should be regarded as being worth, say, 6s. per cwt. lower, this amount being made up as follows :—English duty, 2s. ; freight, 1s. 9d. ; landing charges, 2s. 3d.

These prices were considered very high ; and they were, indeed, from 0s. to 15s. per cwt. higher than the prices paid at the opening of the preceding season. Business was, in consequence, very small. Prices remained almost unchanged for the first month of the season, with fairly good business in fruit below 30s. and with restricted sales for the dearer qualities. Pyrgos continued in great favour.

By the second week in October, the c.i.f. quotations for Pyrgos in quarter cases weakened to 22s. 9d. and the duty-paid price fell correspondingly to 22s. 6d. The fine qualities remained practically unchanged in price down to the end of the year, but business in them was very much restricted. Pyrgos and Provincial fruit monopolized the interest of the market and its price gradually hardened, and closed at the end of December at 27s. 9d. per cwt., duty paid, the c.i.f. price demanded by Greece being then 25s. For the remaining five months of the season, fine fruit continued neglected until its owners were compelled to reduce the price almost to the level of Provincial before they could sell it. Choicest shade-dried Vostizzas, for which the owners refused 43s. in October, were sold at 30s. in June ; parcels of Zante, which refused 32s. in October, are now on offer at 26s. Pyrgos and Provincial fluctuated between 27s. 3d. and 20s. up to June. It has since dropped by easy stages to 25s. duty paid. The following quotations of 23rd August were the lowest for the season.

	Per cwt., duty paid.
Vostizza, including finest shade dried	... 27s. to 30s.
Gulf, including Panariti, Patras, and Zante ...	... 26s. to 28s.
Amalias	... 25s. 6d.
Pyrgos and Provincial, in ¼-cases	... 25s.
Pyrgos and Provincial, in 56-lb. bags	... 24s. 6d.

"The heavy drop in the price of the finest qualities of Vostizza is a great disappointment to the growers of this excellent fruit—it brings home to them *the conviction that it does not now pay to grow fine fruit. The experience gained* during the closing season confirms the view that the public revolts against high prices. They will buy fine Vostizza at 4d. per lb., but they will not stand it at 5d. and 6d. They bought it eagerly in 1909-10. They let it alone in 1910-11. It can now be stated as an axiom that when the fine growths of currants can be bought in the market at 3s. to 5s. per cwt. over the price of the Provincial growths, but never much above 30s. duty paid, they will be the first to go into consumption in the United Kingdom, and inversely, that when the difference is over the 5s. limit, they will be the last.

A large quantity of small fruit has gone into consumption during the season, at all prices, from 38s. down to 27s. per cwt., duty paid. The 56-lb. bag has grown into favour. The dry condition in which the last crop was gathered has prevented the marked deterioration of the fruit during transit, which had occurred during former years, when bags had been imported.

We adhere, however, to our opinion that the bag is an unsuitable package for currants, except, perhaps, the very smallest and dried siftings, and that the deterioration of the quality and loss in weight render the saving more apparent *than real.*

The popularity of currants in the United Kingdom has suffered very little by the high prices, the decrease in clearances, as compared with the previous season, being only 2 per cent., while the price paid was increased, on the average, by 30 per cent.

The decrease in Commonwealth imports is given as 2,000 tons, the writer's remarks being scarcely complimentary to our rapidly increasing currant industry:—

It appears that the heavy protective duty of £28 per ton, equal to more than 150 per cent. on the prime cost, levied by the Commonwealth of Australia, is fostering the production of some sort of currants in the States of Victoria and South Australia, and this accounts mainly for the restriction of the importation of the Greek article.

Seeing that a sample of Angaston (South Australia) currants, equal to Mildura standard (3 crown), were valued in London, some three months back, when prices were not at their best, at 40s. per cwt., they are surely worthy of being described as something better than "Some sort of currants."

*In all countries, except France, there has been a decrease in the im*portation of currants; that country, however, imported over five times as many currants in 1910-11 as in 1909-10, the bulk of them being for manufacturing purposes.*

The universal consumption outside Greece has been about 114,000 tons, against 118,000 tons in 1909-10 and 113,000 tons in 1908-9. The visible universal stocks at the end of this month are estimated at 6,500 tons, excluding stocks in Greece, but including cargoes of old fruit afloat, against 6,000 tons in 1910 and 4,000 tons in 1909.

As regards the 1911 crop, forecasts have varied a good deal. At first, after-effects of downy mildew during the previous season were feared; then drought; then heavy rains. Messrs. Burlumi estimate that it will not exceed 155,000 tons. Forward sales for September delivery have been made since as early as January last. The quotation on 23rd August last for g.a.s.d. Pyrgos was 22s. per cwt. c.i.f. London. No business has been done in, and no quotations are in the market for, the finer qualities. Large forward sales have been made to Germany, chiefly of "cleaned Amalias," at prices ranging from 25s. to 20s. per cwt. c.i.f. Hamburg; it now (23rd August) stands at 22s. 6d. Common Provincial in 1-cwt.

* No doubt converted into wine. The official figures show a large increase in the quantity of wine made from dried grapes in France in 1910; viz. 203,302 gallons as against 6,380 in 1909. In 1890 France manufactured 94,442,700 gallons of wine from dried grapes. From that time until last year the quantity had steadily declined. See *Revue de Viticulture*, 31st August, 1911.

bags, for manufacturing purposes, has been sold at from 17s. 6d. up to 20s. 6d. per cwt. c.i.f. Rotterdam.

Frequent allusion is made to the Privileged Currant Company which, it will be remembered, is a semi-Government institution, founded some years back at a time of severe crisis, owing to very low prices, in order to improve matters by holding over or otherwise dealing with the surplus currant production. Subsidized eradication of vineyards has also been resorted to by the Greek Government. Though the currant situation has certainly improved, the working of the convention for eradication still continues; about 4,000 acres were uprooted last year, the compensation paid by the Privileged Company amounting to a little over £66,000. It is expected that 10,000 acres will be uprooted during the next twelve months.

The Privileged Company received during the season in their warrant stores 9,200 tons of fruit, all of which has been taken out. They have purchased 2,500 tons of fresh currants, but not any dried fruit, as the market prices have been, all through the season, above the convention limits. In their retention stores the company received 27,000 tons, making with the balance brought over from the previous season, 44,500 tons. Of this quantity, 40,500 tons have been appropriated as land tax for the shipment of the 114,500 tons, and the balance is carried over to the new season in retention certificates. The retention currants, as well as the fresh currants purchased by the company, have been sold as usual to the local distillers and the Wine and Spirits Company. The total quantity of currants used by these manufacturers during the season has been 47,000 tons, against 38,000 and 39,000 tons during the two preceding seasons.

There was no dividend paid on the shares of the Privileged Company in 1910. The Wine and Spirits Company paid 14 per cent. for 1910 and an interim dividend of 5 per cent. for 1911.

The numerous references to shade-dried fruit, as being of highest quality, are interesting; they prove that recent developments at Mildura, where the use of drying racks is replacing the older method of drying in trays, in the sun, are on essentially sound lines.

Professor Perkins, Principal of Roseworthy Agricultural College, South Australia, in his interesting reports on "Agriculture in Other Lands" refers to the Greek currant crisis as follows*:—

Prior to 1870, the average currant crop appears to have been about 75,000 tons, the whole of which found a very ready market. Towards that time European vineyards began to die out before the attacks of the phylloxera, and as in the south of Europe wine practically forms a staple article of diet of the whole population, wine merchants proceeded to buy up in the East all dried fruit available, including currants, from which wine could be made. The misfortunes of European vine-growers gave a tremendous impetus to currant planting in Greece, with the result that production at the present time is between 185,000 and 190,000 tons a year. So long as Europe required currants for wine-making purposes there was no particular difficulty in disposing of this large crop. In the course of time, however, European vineyards were gradually built up again on American stocks, and this particular opening for surplus currants was lost. At the present moment, the world's consumption of currants is much below the annual production of Grecian vineyards. Thus, according to Mr. Alban Young, in his report on Greek finances for 1907-8, the world's consumption of currants in 1905-6 was represented by 112,500 tons, in 1906-7 by 116,000 tons, and in 1907-8 by 120,000 tons.

Thus, each year, a heavy surplus has been left on the hands of growers and merchants, with the result that the market has become completely disorganized. The importance of the interests concerned has been so great and the outcries so emphatic that, for the last fifteen years or so, the Government has been endeavouring by special legislation to dodge the economic Nemesis that threatens Greek currant growers. It is unnecessary to detail all the expedients that they have resorted to; it may be stated, however, that for the most part they appear to have been illusory. In ultimate resort, the further planting of currant vines has been prohibited by law, and a new law has been introduced, giving power to the Privileged Currant Company to cause the uprooting of surplus vineyards subject to the payment of adequate compensation.

* *Journal of the Department of Agriculture of South Australia*, August 1910, p. 27.

VICTORIAN EGG-LAYING COMPETITION, 1911-12,

CONDUCTED AT BURNLEY HORTICULTURAL SCHOOL.

(Continued from page 700.)

H. V. Hawkins, Poultry Expert.

No. of Pen.	Breed.	Name of Owner.	Eggs Laid during Competition. April to August.	Sept.	Total to Date (6 months).	Position in Competition.
12	White Leghorn ..	W. G. Swift ..	615	162	777	1
40	,, ..	A. J. Cosh (S.A.) ..	612	143	755	2
31	,, ..	R. W. Pope ..	588	145	733	3
33	,, ..	Range Poultry Farm (Qld.)	531	143	674	4
20	,, ..	H. McKenzie ..	505	151	656	5
37	,, ..	E. Waldon ..	505	141	646	6
18	,, ..	S. Brundrett ..	506	131	637	7
13	Black Orpington ..	D. Fisher	485	124	609	8
46	Minorca ..	G. W. Chalmers ..	452	151	603	9
32	Silver Wyandotte ..	M. A. Jones ..	444	128	572	10
21	White Leghorn ..	R. L. Appleford ..	425	139	564	11
25	,, ..	B. Mitchell ..	421	143	564	
44	Black Orpington ..	T. S. Goodisson ..	428	127	555	13
55	White Leghorn ..	W. G. McLister ..	412	140	552	14
66	White Wyandotte	J. E. Bradley ..	429	113	542	15
39	White Leghorn ..	A. W. Hall ..	406	133	539	16
63	Black Orpington ..	A. J. Treacy ..	439	95	534	17
67	White Leghorn ..	C. L. Sharman ..	397	133	530	18
10	Black Orpington ..	H. A. Langdon ..	402	121	523	19
36	White Leghorn ..	F. A. Sillitoe ..	390	131	521	20
51	,, ..	J. W. McArthur ..	406	114	520	21
9	,, ..	J. O'Loughlin ..	390	130	520	
44	,, ..	Mrs. C. R. Smee ..	375	138	513	23
1	,, ..	A. Brebner ..	380	133	513	
4	Golden Wyandotte	H. Bell	370	135	505	25
19	White Leghorn ..	A. Jaques ..	371	133	504	26
24	,, ..	F. Hannaford ..	379	119	498	27
3	,, ..	K. Gleghorn ..	361	131	492	28
22	Black Orpington ..	P. S. Wood ..	371	117	488	29
58	Faverolles ..	K. Courtenay ..	356	128	484	30
60	White Leghorn ..	C. H. Busst ..	338	142	480	31
28	,, ..	J. Campbell ..	339	141	480	
5	,, ..	L. C. Payne ..	349	128	477	33
49	,, ..	W. J. Thornton ..	324	146	470	34
42	White Orpington ..	P. Mitchell ..	355	114	469	35
65	White Leghorn ..	H. Hammill (N.S.W.)	333	135	468	36
27	,, ..	Hill and Luckman ..	341	127	468	
2	,, ..	E. P. Nash ..	318	141	459	38
45	,, ..	T. Kempster ..	315	140	455	39
41	,, ..	Morgan and Watson ..	333	121	454	40
47	,, ..	C. W. Spencer (N.S.W.)	318	134	452	41
8	,, ..	T. W. Coto ..	343	107	450	42
60	,, ..	J. J. Harrington ..	314	132	446	43
59	,, ..	W. H. Dunlop ..	308	136	444	44
54	,, ..	F. Hodges ..	338	99	437	45
43	,, ..	W. B. Crellin ..	304	128	432	46
30	Black Orpington ..	Rodgers Bros. ..	282	144	426	47
11	Brown Leghorn ..	F. Soncum ..	286	136	422	48
62	White Leghorn ..	P. Hodson	278	136	414	49
52	,, ..	W. J. McKeddie ..	274	138	412	50
53	,, ..	A. Stringer ..	284	128	412	
57	,, ..	G. E. Edwards ..	271	133	404	52
6	Silver Wyandotte ..	Mrs. H. J. Richards	267	135	402	
16	,, ..	Miss A. Cottam ..	267	135	402	53
23	Golden Wyandotte	G. E. Brown ..	282	120	402	
34	White Leghorn ..	E. Dettman ..	251	121	372	56
26	,, ..	F. Seymour ..	252	117	369	57
7	,, ..	H. Stevenson ..	233	123	356	58
61	Silver Wyandotte	J. Reade	232	119	351	59
35	White Leghorn ..	J. H. Brain ..	208	135	343	60
14	Black Orpington ..	W. J. Macauley ..	202	114	316	61
56	White Leghorn ..	Mrs. C. Thompson ..	190	119	309	62
17	,, ..	W. J. Eckershall ..	195	112	307	63
64	,, ..	J. D. Read ..	171	131	302	64
15	Minorca ..	H. R. McChesney ..	125	105	230	65
48	,, ..	J. James	83	68	151	66
			23,054	8,512	31,566	

THE BROOM FIBRE INDUSTRY.

Temple A. J. Smith, Chief Field Officer.

The growing of Broom Corn for the purpose of providing material for the manufacturing of what are known as American House Brooms is an industry capable of greater development in Victoria, and it is one that should be of value to holders of small blocks of land, and particularly so where irrigation is possible. Whilst it has been amply proved that the fibre, of excellent quality, and yielding a good profit, can be grown in many parts of Victoria, considerable quantities are imported annually from oversea, and also from the neighbouring States of the Commonwealth.

At the present time, the area under cultivation is approximately 450 acres. The bulk of the locally-grown fibre comes from the Ovens and King River Valleys, where it is grown on the alluvial flats having a fair rainfall, or where the land is irrigable. There are many localities in other portions of the State in which the crop could be grown equally well, and I believe that, were the knowledge necessary to produce the crop more generally acquired, the industry would be largely increased and widely distributed.

Soils and Manures.

Broom corn will grow well wherever maize will thrive. It is a hardier crop than the latter, standing drought to a greater extent, and making better growth under adverse conditions It will not stand frost and is essentially a summer crop. Sandy loams and rich river flats are most suitable; stiff heavy clays are very unsuitable. Rich chocolate soils will also give good crops.

In order to get the best results, the following fertilizers should be applied about four to six weeks before the seed is sown:—

Superphosphate	100 lbs.
Bonedust	100 lbs.
Sulphate of Ammonia	50 lbs.
Sulphate of Potash	30 lbs.

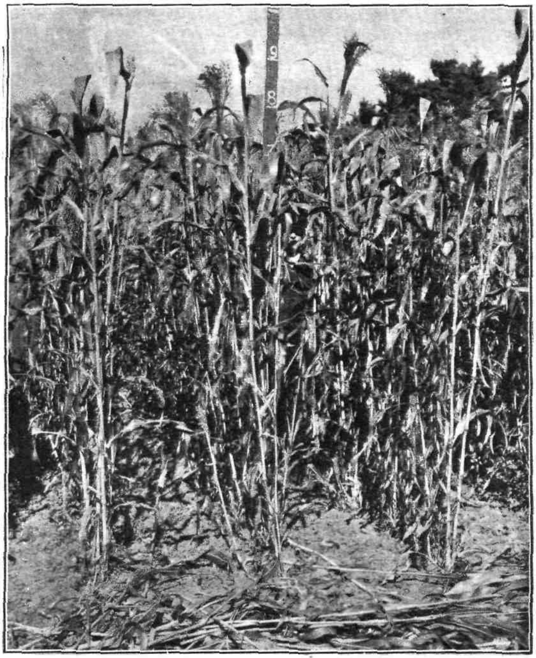
The cost of the whole will be, approximately, 20s. per acre. Farmyard manure, at the rate of 10 tons per acre, is especially valuable. If obtainable, it should be applied in the autumn, and worked into the land.

Sowing.

The seed should not be planted until the danger of frost is past—from October to December. The land must also be well drained and in a warm condition. If sown in cold wet soils, it is liable to rot and poor germination will result. Seeding at the rate of 4 lbs. per acre is sufficient, if sown regularly; the drills should be 3 ft. apart and the plants 7 to 8 in. in the drills. If sown too thickly, the plants will require to be thinned out, which will add at least 20s. per acre to the labour bill; the crop will also suffer in both quality and yield, the broom being faulty and of smaller growth. The seed should never be sown more than 2 in. below the surface, as the first shoot is thin and delicate and cannot force its way through, if sown deeply.

As seed is so cheap and is required in such small quantities, it is advisable to grade it, and to sow only heavy samples. Many growers

immerse the seed in water and float the light seed to the surface; the latter is then skimmed off and thrown to the fowls. It is also wise to treat the seed with a 2 per cent. solution of bluestone, similarly to wheat and oats.



1. *CROP OF BROOM MILLET.*

Maize sowers are now fitted to sow broom seed; and, in clean sandy soils, the hand Planet Jr. seed sower answers well.

CULTIVATION.

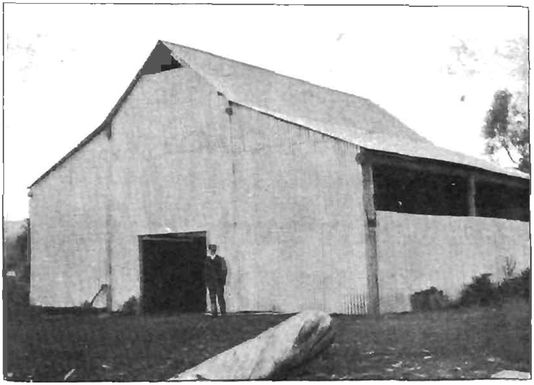
The land should be fallowed and well worked through the winter to kill the weeds and to get the land in good order. Firming the land with a roller before drilling is a good system. As soon as the young plants are 4 to 6 in. high the whole field should be harrowed. If slightly on the

thick side, an extra harrowing can be given, always working across the drills. Until the crop is 6 or 7 ft. high, it will be necessary to use a Planet Jr. horse hoe between the rows to keep down the weeds and to keep the soil loose on the surface.

Where irrigation is practised, two applications of water should suffice; one when the crop is about 12 in. high, and another just after the last hoeing.

Sheds.

Sheds for drying can be built of bush timber; provided the roof is watertight, any material will suffice. Plenty of ventilation is an essential, especially under the eaves and gable ends so as to allow the moist air every opportunity of escaping freely. Doors at each end, and sides that can be easily opened up, will be found advantageous, so that the air can be admitted from whichever side the wind is coming.



2. DRYING SHED.

The quicker the curing process, the better the sample of fibre, so far as colour is concerned. The green colour is fixed by fast drying, whereas a slow process admits of bleaching, which is not desirable.

The floors of the shed can be from 2 to 4 ft. apart, one above the other. The former distance economizes the space where shed room is not abundant. The 4-ft. height, however, admits of easier working.

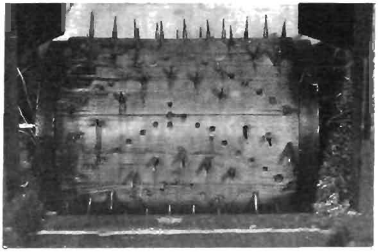
Harvesting.

A crop planted the first week in November will generally be ready to harvest in March and April. The stage at which fibre is cut is important. It should commence directly the seed begins to harden, as it is advisable to have the green colour kept in the fibre. This gives it a greater value.

When cut at this stage, the stalks will also be more useful as fodder for stock. In many cases, harvesting is extended over two and sometimes three months, but the colour of the fibre is bound to suffer if the crop is allowed to become over-ripe. As a slight compensation, the seed, however, will develop to a greater extent under such circumstances.

There are several methods of harvesting. The most popular, especially where the stalks are required for fodder or silage, is to break down all the stalks to the ground in every fifth row, lapping them on one another the whole length of the row. During the process, the heads are cut off from 4 to 6 in. below the junction of the panicles with the main stalk. This operation is performed with a heavy butcher's knife.

The 6-in. lengths are left on the short heads and the 4-in. lengths on the long. Any sheaths attached to the stalk must be rubbed off, and the heads kept straight in the hand with the butts all one way until a handful is gathered. These are then laid across the stalks on the ground in such a way that the panicles are kept clean of dirt, and the air allowed to circulate freely throughout to dry any surplus moisture as fast as possible. The standing rows are bent over and the tops cut off in the same way and laid on the broken-down row.



3. ROLLER FOR THRESHING.

It is found more expeditious for each cutter to take two rows at a time; it will require five quick men to cut an acre in one day. If the crop has been sown thickly it will take longer, as three small heads must be handled as against an equivalent weight in one large head; the sample will also be inferior. Very small heads and bad heads are better not cut at all, as they will not pay to handle and are also liable to damage the market value of the whole.

Once cut, the fibre should not be left in the field more than one day. If rain is feared, the fibre should be taken straight to the curing shed where it should be laid on floors of saplings, battens, or wire-netting to dry. The layers of fibre should not be more than 3 in. in depth and the air should be allowed free circulation from underneath. In conveying the broom to the shed, the use of large baskets will effect a great saving of time in loading and unloading. In dry weather, the fibre will cure or dry out in 6 or 7 days; it can then be bulked with the heads all one way, and the floor used for a fresh supply. In wet weather, it may be necessary to put log fires under the floors to assist in drying out, but this is rarely required.

The bulk should be examined every few days to ascertain if heating is taking place; if the temperature is rising, it should be broken down and re-spread for a day or two. If allowed to heat, the fibre will turn black, and in bad cases will rot away.

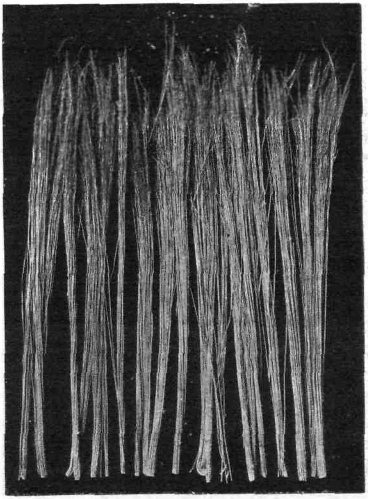
THRESHING.

The seed is threshed by means of a roller—a drum 2 ft. in length and 12 in. in diameter This drum is studded with spikes which are screwed in 4 in. apart, spirally or diagonally. The spikes should be 3 in. in length from the surface of the drum, and the distance between the rows from 6 to 8 in. A spindle with a pulley on one end is run through the centre of the drum.

The roller should be driven by any power available, at the rate of 1,500 revolutions per minute. The draught is very light. Hand power may be used, but some motive power will be found best. Where a large quantity is dealt with double rollers are used, the machine being generally home made. A very useful single machine can be bought for £10.

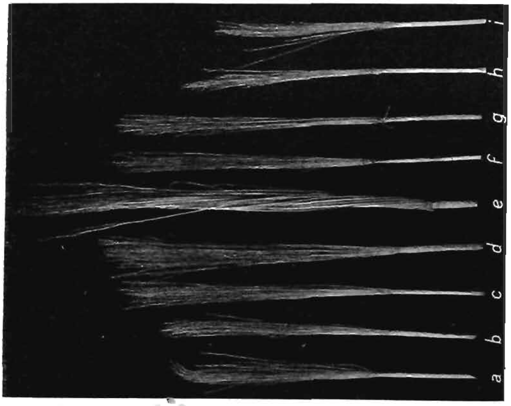
The method of threshing is simple. To do the work expeditiously, four hands are required. The first gets the fibre down, and passes the stalks to the second man on the roller, four to five stalks at one time. The seed ends are lightly laid by the latter on the revolving roller, and turned once. By this action, practically all the seed will be taken off. Care must be taken not to thresh too severely, as damage to the brush at the end of the fibre will be caused. It is better to err on the light side, if any.

When finished, the stalks are thrown on to a table where a third man grades the fibre and ties each sample into bundles, about 5 in. in diameter, with twine, and throws them on to the floor of the shed ready for packing. All the crooked or bent broom should be kept separate, and two qualities made of the straight. The best in length and colour is made the first sample, and the shorter and slightly inferior, the second.

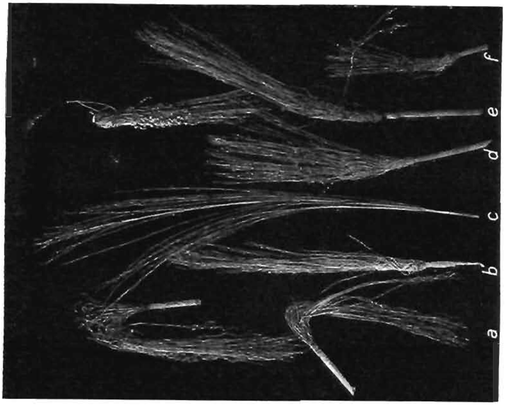


4. FIRST GRADE MILLET.

Illustration No. 4 shows a fine sample of first-grade millet, known as hurl. The stalks are cut off and the fibre put on the outside of the broom. This is quite 2 ft. of fine straight fibre and of good colour. Some slightly inferior samples are shown in illustration No. 5. All of them, however, are of value for working into the centre of brooms or for making whisks. As they work in for the same broom they can all be regarded



5. INFERIOR SAMPLES OF FIBRE.



6. BAD SAMPLES OF FIBRE.

Whilst the samples in No. 5 are slightly inferior, they are suitable for working into the centre of brooms, also for making whisks.

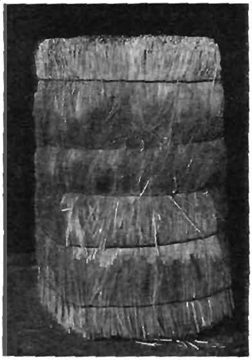
as one sample. Plate No. 6 shows bad samples of fibre; *C* has a bad coarse stalk in the middle, rendering it unfit for a good broom; *B* and *D* can only be used for inferior brooms or whisks; *A* and *E* cut a great deal of waste; and *F* is not worth harvesting, and should have been left in the paddock.

Care of the Seed.

After threshing, the seed should be dried thoroughly. If found to be heating, turn it with a shovel in order to cool it. It should then be well winnowed and bagged. If stored in a dry place, it will keep for years. A 4-bushel bag of seed weighs 200 lbs. and over, whilst poor seed will weigh 160 lbs. or less.

Seed Selection.

Seed selection should be carried out in the field as the crop ripens. Choose only those stalks which show healthy growth, with straight, fine, and long fibre. Before cutting, these should be allowed to ripen until the seed is hard. They should then be marked with a piece of red flannel to distinguish them from the general crop. The varieties which give the best results are—Italian, Green Missouri, and Dwarf Missouri.



7. AVERAGE BALE OF RATHER SHORT FIBRE.

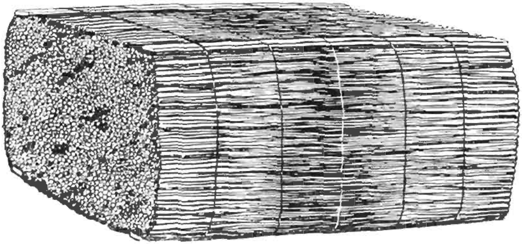
Baling.

Though seldom done in Victoria, each sample should be baled separately. The operation is performed in a box specially made for the purpose. It has movable sides, and no bottom. The inside measurements are 42 in. by 30 in., the sides being 48 in. high.

The press is placed on level ground, with wires to the number of five placed across the bottom. The fibre is then laid lengthwise in the press, keeping the butt to the outside and as level as possible. A false top, with battens nailed across the top at intervals of 3 in., is put on, battens downwards, and a lever or screw press applied. This can be put down twice or three times, refilling the box until a bale containing 250 lbs. is made. The sides are then taken away, the pressure on the lid being maintained. The wires are brought up and put through beside the battens and tied. After removing the lid the bale is rolled out. In addition to the body wires, it is wise to put a wire from end to end of the bale, if the fibre has to be sent any great distance, especially by rail. Slats are sometimes used on each edge of the bale, but the custom is rare in this State. Plate No. 7 shows an average bale of rather short fibre.

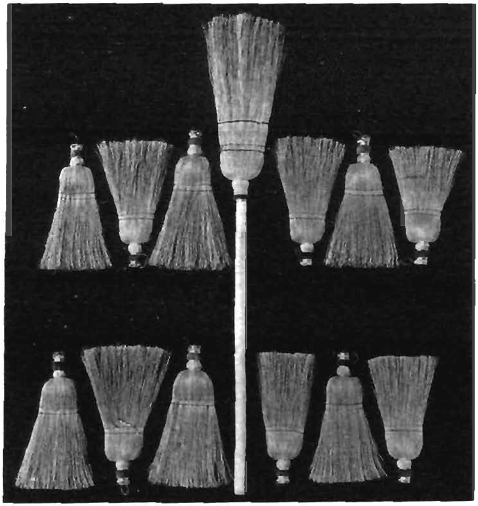
Commercial Returns.

The amount of marketable fibre taken from an acre is from 7 to 10 cwt., the value ranging from £20 to £35 per ton. Taking the yield of fibre at



8. CORRECT METHOD OF BALING.

7 cwt. per acre, and the average value at £25 per ton, the fibre alone is worth £8 15s., whilst the value of the seed (3 bags per acre, at 7s. per



9. BROOM AND WHISKS—VICTORIAN MANUFACTURE.

bag) is £1 1s., or a total of £9 16s. 9d. per acre, without taking into consideration the value of the stalks as fodder.

If all labour is paid for, the cost of growing will be as follows:—

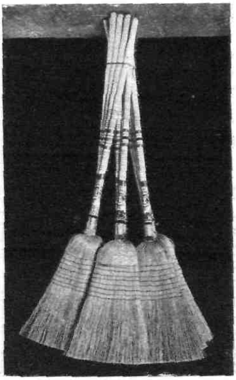
	£	s.	d.
Ploughing twice, and harrowing	0	15	0
Seed (4 lbs. per acre)	0	0	8
Sowing	0	1	0
Horse-hoeing (three times between rows)	0	6	0
Harvesting	1	10	0
Curing and threshing	0	10	0
Baling for market	0	10	0
Winnowing seed (three bags at 1s., ...	0	3	0
Bags	0	1	6
Sundries, including wire, twine, &c.	0	1	0
	3	18	2

Leaving a profit of £5 17s. 10d. per acre.

Where the grower has his own labour and that of the members of his family, much of the foregoing expenditure would be saved, and with heavier yields than those taken for an estimate, the returns would be considerably enhanced. Growers on the King River reckon the net average returns at from £6 to £8 per acre.

Fodder Value.

Besides the utility of broom corn for manufacturing purposes, it has a high fodder value. The crop should be harvested before it is thoroughly ripe and the stalks made into silage. On analysis, the quality of the latter is equal to maize; cattle eat it greedily and thrive upon it. The stalks are more easily harvested than maize for this purpose, and can be handled better for the chaff-cutter. The seed, which is of value as fowl feed, and for pigs, contains a fair percentage of oil and flour. As its properties, however, are fattening, it is not conducive to egg-laying when fed to poultry. Horses do well on the seed for winter feed, but care must be taken to have it well cleaned and winnowed, otherwise the dust is liable to have bad effects.



10. AMERICAN BROOMS — VICTORIAN MANUFACTURE.

Prospects.

As stated previously, the fibre is utilized in the manufacture of American brooms; whisks are also made. Mr. Albert Oates, of North Melbourne, one of our largest manufacturers, to whom I am indebted for photographs of the finished article, states that the market for whisks is a growing one, and that he is compelled to import fine textured fibre for their manufacture. He has, however, obtained for the purpose some locally-grown fibre of which he thinks highly. He is of opinion that the growing of fine fibre would pay, as the price per ton would be considerably higher, ranging to £40 per ton.

In addition to our local market, there should be a fair opening for broom fibre in Tasmania and Western Australia. A sample of Victorian millet sent to England was valued at £22 per ton, and inquiries made for a supply.

Good millet will always pay, and a careful grower will never fall short of a market. On any fairly-equipped farm, the crop can be grown with little expense for machinery; and, in conjunction with other farming pursuits, is worthy of a trial in suitable districts.

RED POLLS AS MILKERS.

Temple A. J. Smith, Chief Field Officer.

The following tables show the milking returns from a small herd of Red Polled Cattle, which has been kept at the Government Tobacco Farm at Whitfield for the past milking season. Six of the milkers were on their first calf, six others on their second, and one cow, Beulah, on her fourth.

These cows have been fed on the produce of the farm only, no bran or other feed being purchased for them. The natural grasses on the 113 acres on which they were kept are of poor rough quality, but green crops of rye, oats, and mixtures of rye, peas, and vetches have been grown for the herd. Oaten hay has also been liberally fed, together with silage made from rye, peas, vetches, oats, and maize.

The cows were selected as heifers by Dr. S. S. Cameron from a herd bred by Mr. M. Evans, of Lima South, who has given special attention to the development of a milking strain of the breed. On several occasions, Mr. Evans took prizes at the Benalla Show, both for butter-fat test and for quantity of milk. The bull ("Tabacum") used in the Government herd was purchased from Captain Philip Charley, of "Belmont," Richmond, N.S.W., and is by the imported sire "Acton Ajax," in whose ancestry the milking strain is strongly developed. His first lot of calves show fine milking features, in addition to the other well-known characteristics of the breed. There has been a good demand for the bull calves, which have been sold at six months old, at prices based on the milk-yielding capacity of the dam.

The absence of horns is a great advantage in dairy cattle, and in this herd there has been no instance of injury to one animal by another. The cattle are splendid doers, being always in good condition. When dried off they put on beef quickly. Being small-boned they are in good favour with the butchers.

All the cows in this herd are easy milkers with good teats of fair size. These qualifications, taken in conjunction with the milk yields,

justify the hope that, with reasonable care in selection, the breed will quickly become recognized as second to none for all-round dairying purposes.

The weights of the milk yielded daily were taken, and the monthly fat test made by the Dairy Overseer, Mr. E. Steer, who has taken a great interest in the herd, and handled it successfully from the beginning. It will be noted that seven of the cows milked 283 days. This is due to the fact that they calved within a few days of each other. The records started from the 1st September, 1910, and finished on the 10th June, 1911.

GENERAL VIEW OF THE HERD.

Consequent on the Whitfield farm having been sold, the herd has been transferred to the Department's Beet and Dairy Farm at Boisdale, Gippsland, where the bulls will be available to settlers on the neighbouring beet farms.

YIELDS AND RETURNS OF THE WHITFIELD EXPERIMENTAL FARM HERD.

(FROM 1ST SEPTEMBER, 1910, TO 10TH JUNE, 1911.)

Cow.	Days in Milk.	Weeks in Milk.	Milk in gallons.	Tests.	Butter Fat.	Prices.	Values.
							£ s. d.
Vuelta	270	38½	556·5	7·0–7·8	405·14	9½d.–11¾d.	17 10 10
Bullion	283	40½	773·3	4·2–5·0	356·71	9½d.–11¾d.	15 17 10
Connecticut ..	283	40½	818·2	4·2–4·6	269·06	9½d.–11¾d.	11 17 4
Virginia	283	40½	636·2	3·8–4·6	254·75	9½d.–11¾d.	11 5 1¼
Carolina ..	283	40½	570·5	4·2–4·8	253·14	9½d.–11¾d.	11 3 4¾
Havana .	283	40½	575·5	3·8–4·6	229·97	9½d.–11¾d.	10 5 0½
Cuba	283	40½	526·9	4·2–4·8	231·89	9½d.–11¾d.	10 5 11
Muria	283	40½	548·9	4·2–6·2	240·70	9½d.–11¾d.	9 14 9¾
Kentucky ..	245	36½	531·1	4·0–4·6	225·98	9½d.–11¾d.	9 12 7
Cigarette ..	238	34	504·4	4·0–4·6	211·61	9½d.–11¾d.	8 18 9
Beulah	135	19¼	397·4	4·9–4·2	200·44	9½d.–10½d.	8 5 2
Pennsylvania ..	270	38½	461·9	4·0–4·4	189·75	9½d.–11¾d.	8 4 3¼
Sumatra ..	30	4¼	43·6	4·5	19·62	11¾d.	0 19 2½
	..	..	6746·4	..	3088·76	..	134 0 3

Month.	Yield for each Month. Milk in gallons	Test.	Butter Fat.	Price.	Value.	Totals from Calving to Date. Days in Milk	Milk in gallons.	Butter Fat.	Value.
			lbs.	d.	£ s. d.			lbs.	£ s. d.
Vuelta (due to calve, 12th August, 1911).									
September ..	*44·1*	*7·4*	*31·31*	*11¾*	*1 10 7¾*	*17*	*44·1*	*31·31*	1 10 7¾
October ..	88·6	7·4	65·56	11½	3 2 10	48	132·7	96·87	4 13 5¾
November ..	86·9	7·8	67·78	10¾	3 0 8½	78	229·6	164·65	7 14 2½
December ..	70·9	7·6	53·88	10¼	2 6 0½	109	300·5	218·53	10 0 2½
January ..	60·9	7·4	45·06	10	1 17 6½	140	361·4	263·59	11 17 9
February ..	53·4	7·0	37·38	9¾	1 10 4½	168	414·8	300·97	13 8 1½
March ..	59·4	7·4	43·95	9½	1 14 9½	199	474·2	344·92	15 0 11
April ..	*52·3*	*7·5*	*39·22*	*9¾*	*1 11 10¼*	*229*	*526·5*	*384·14*	16 12 9¼
May ..	25·5	7·0	17·85	10	0 14 10½	260	552·0	401·99	17 7 7¾
June ..	4·5	7·0	31·5	10¼	0 3 2¼	270	556·5	405·14	17 10 10
Bullion (due to calve, 8th August, 1911).									
September ..	117·5	4·5	52·87	11¾	2 11 9	30	117·5	52·87	2 11 9
October ..	123·3	4·5	55·48	11½	2 13 2	61	240·8	108·35	5 4 11
November ..	114·7	4·3	49·32	10¾	3 4 2	91	355·5	157·67	7 9 1
December ..	91·3	4·4	40·17	10¼	2 1 10	122	446·8	197·84	9 10 11
January ..	73·9	4·2	31·04	10	1 5 10½	153	520·7	228·88	10 16 9½
February ..	62·6	5·0	31·30	9¾	1 5 5	181	583·3	260·18	12 2 2½
March ..	70·0	4·9	34·30	9½	1 7 1½	212	653·3	294·48	13 9 4¼
April ..	61·8	5·0	30·90	9¾	1 5 1¼	243	715·1	328·78	14 14 5½
May ..	47·4	4·8	22·75	10	0 18 11½	273	762·5	351·53	15 13 5
June ..	10·8	4·8	5·18	10¼	0 4 5	283	773·3	356·71	15 17 10
Connecticut (due to calve, 14th August, 1911).									
September ..	101·8	4·3	43·77	11¾	2 2 10	30	101·8	43·77	2 2 10
October ..	98·6	4·3	42·40	11½	2 0 7½	61	200·4	86·17	4 3 5½
November ..	86·9	4·6	39·97	10¾	1 15 9½	91	287·3	126·14	5 19 3
December ..	67·5	4·4	29·70	10¼	1 5 4½	122	354·8	155·84	7 4 7½
January ..	50·1	4·4	22·04	10	0 18 4½	153	404·9	177·88	8 3 0
February ..	49·5	4·2	19·80	9¾	0 16 3	181	454·4	197·68	8 19 3
March ..	52·2	4·2	23·18	9½	0 18 4¼	212	509·6	220·86	9 17 7¼
April ..	58·4	4·3	25·11	9¾	1 0 4¾	242	568·0	245·97	10 18 0
May ..	40·3	4·6	18·54	10	0 15 5½	273	608·3	204·51	11 13 5½
June ..	9·9	4·6	4·55	10¼	0 3 10½	283	618·2	269·06	11 17 4
Virginia (due to calve, 26th August, 1911).									
September ..	112·6	4·0	45·05	11¾	2 4 1¼	30	112·6	45·05	2 4 1¼
October ..	106·0	4·0	42·40	11½	2 0 7½	61	213·6	87·44	4 4 8¾
November ..	94·3	3·9	36·78	10¾	1 12 11¾	91	312·9	124·22	5 17 8½
December ..	69·3	3·8	26·33	10¼	1 2 5¾	122	382·2	150·55	7 0 2¼
January ..	55·9	3·9	21·80	10	0 18 2	153	438·1	172·35	7 18 4¼
February ..	*51·8*	*4·2*	*21·75*	*9¾*	*0 17 8*	*181*	*489·9*	*194·10*	*8 16 0¼*
March ..	59·8	4·1	24·52	9½	0 19 5	212	549·7	218·62	9 15 5¼
April ..	51·3	4·0	20·52	9¾	0 16 8	242	601·0	239·14	10 12 1¼
May ..	29·4	4·4	12·94	10	0 10 9½	273	630·4	252·08	11 2 10¾
June ..	5·8	4·6	2·67	10¼	0 2 3¼	283	636·2	254·75	11 5 2
Carolina (due to calve, 28th August, 1911).									
September ..	93·2	4·4	41·00	11¾	2 0 1¾	30	93·2	41·00	2 0 1¾
October ..	89·3	4·4	39·40	11½	1 17 8	61	182·5	80·40	3 17 9¾
November ..	82·1	4·6	37·76	10¾	1 13 9	91	264·6	118·16	5 11 6¾
December ..	67·2	4·4	29·57	10¼	1 5 4¾	122	331·8	147·73	6 16 11½
January ..	54·3	4·6	24·98	10	1 0 9¾	153	386·1	172·71	7 17 9¼
February ..	48·6	4·2	20·41	9¾	0 16 7	181	434·7	193·12	8 14 4¼
March ..	52·7	4·2	22·13	9½	0 17 6½	212	487·4	215·25	9 11 10½
April ..	49·8	4·4	21·91	9¾	0 16 11¾	242	537·2	237·16	10 8 10¼
May ..	26·1	4·8	12·53	10	0 10 5¼	273	563·3	249·69	10 19 3½
June ..	7·2	4·8	3·45	10¼	0 4 1¼	283	570·5	253·14	11 3 4¾
Havana (due to calve, 22nd August, 1911).									
September ..	91·6	3·9	35·72	11¾	1 14 11¾	30	91·6	35·72	1 14 11¾
October ..	97·3	3·9	37·95	11½	1 16 4½	61	188·9	73·67	3 11 4½
November ..	86·3	3·8	32·79	10¾	1 9 4½	91	275·2	106·46	5 0 8¾
December ..	69·7	3·9	27·18	10¼	1 3 2½	122	334·9	133·64	6 3 11¼
January ..	57·3	3·8	22·37	10	0 19 5¾	153	392·2	156·01	7 3 5
February ..	51·0	4·0	20·40	9¾	0 16 7	181	443·2	176·41	8 0 0
March ..	53·9	4·1	22·10	9½	0 19 2	212	497·1	198·51	8 19 2
April ..	48·9	3·9	19·07	9¾	0 15 6	242	546·0	217·58	9 14 8
May ..	*25·2*	*4·2*	*10·58*	*10*	*0 8 9¾*	*273*	*571·2*	*228·16*	*10 3 5¾*
June ..	4·3	4·6	1·81	10¼	0 1 6½	283	575·5	229·97	10 5 0¼

	Yield for each Month.					Totals from Calving to Date.			
Month.	Milk in gallons	Test.	Butter Fat.	Price.	Value.	Days in Milk	Milk in gallons.	Butter Fat.	Value.
			lbs.	d.	£ s. d.			lbs.	£ s. d.
				Cuba (due to calve, 15th August, 1911).					
September ..	85·8	4·4	37·88	11¾	1 16 11½	30	85·8	37·75	1 16 11½
October ..	86·1	4·4	37·88	11½	1 16 3½	61	171·9	75·56	3 13 3
November ..	75·8	4·4	33·35	10¾	1 9 10½	91	247·7	108·88	5 3 1½
December ..	62·1	4·2	26·08	10¼	1 2 3½	122	309·8	134·96	6 5 4¾
January ..	49·4	4·4	21·75	10	0 18 1½	153	357·2	155·81	7 3 5¾
February ..	47·8	4·4	21·03	9¾	0 17 1	181	405·0	176·84	8 0 6¾
March ..	51·7	4·5	23·26	9½	0 18 5	212	456·7	200·10	8 18 11¾
April ..	47·4	4·4	20·85	9¾	0 17 9½	242	504·1	220·95	9 16 9¼
May ..	19·1	4·8	9·17	10	0 7 7¾	273	523·2	230·12	10 4 5
June ..	3·7	4·8	1·77	10¼	0 1 6	283	526·9	231·89	10 4 11
				Muria (due to calve, 12th August, 1911).					
September ..	83·7	4·3	36·00	11¾	1 16 0	30	83·7	36·00	1 16 0
October ..	85·1	4·3	36·59	11½	1 15 0¾	61	168·8	72·59	3 11 6¾
November ..	75·9	4·6	33·91	10¾	1 10 4½	91	244·7	106·50	4 1 11¼
December ..	63·7	4·5	28·66	10¼	1 4 5¾	122	308·4	135·16	5 6 5
January ..	54·1	4·4	23·80	10	0 19 10	153	362·5	158·96	6 6 3
February ..	52·5	4·2	21·96	9¾	0 17 11	181	415·0	180·91	7 4 2
March ..	54·9	4·0	21·96	9½	0 17 4½	212	469·9	202·87	8 1 6½
April ..	51·0	4·1	20·91	9¾	0 16 11¾	242	520·9	223·78	8 18 6¼
May ..	22·0	6·0	13·20	10	0 11 0	273	542·9	236·98	9 9 6¼
June ..	6·0	6·2	3·72	10¼	0 5 3½	283	548·9	240·70	9 14 9¾
				Kentucky (due to calve 24th August, 1911).					
September ..	..	..	..	..	..	..	..	..	..
October ..	71·7	4·2	30·11	11½	1 8 10½	23	92·7	30·11	1 8 10½
November ..	92·7	4·0	37·08	10¾	1 13 2½	53	164·4	67·19	3 1 2¾
December ..	80·2	4·0	32·08	10¼	1 7 5	84	244·6	99·27	4 8 7¾
January ..	63·9	4·0	25·56	10	1 1 3½	115	308·5	124·83	5 9 11¼
February ..	55·7	4·6	25·62	9¾	1 0 9¾	143	364·2	150·45	6 10 9
March ..	65·3	4·5	29·38	9½	1 3 3	174	429·5	179·83	7 14 0
April ..	57·8	4·5	26·01	9¾	1 1 1½	204	487·3	205·84	8 15 1½
May ..	37·4	4·4	16·45	10	0 13 8½	235	524·7	222·29	9 8 10
June ..	8·4	4·4	3·69	10¼	0 3 9	245	533·1	225·98	9 12 7
				Cigarette (due to calve, 20th August, 1911).					
September ..	..	..	..	..	..	..	..	..	..
October ..	50·5	4·1	20·70	11½	0 19 10	16	50·5	20·70	0 19 10
November ..	90·8	4·0	36·32	10¾	1 12 6½	46	141·3	57·02	2 12 4½
December ..	68·1	4·2	28·58	10¼	1 4 5	77	209·4	85·60	3 16 9½
January ..	58·2	4·0	23·28	10	0 19 4¾	108	267·6	108·88	4 16 2¼
February ..	59·0	4·3	24·78	9¾	1 0 1½	136	326·6	133·66	5 16 3¾
March ..	69·2	4·3	29·75	9½	1 2 8½	167	395·8	163·41	6 19 0¼
April ..	58·4	4·3	25·11	9¾	1 0 4¾	197	454·2	188·52	7 19 5
May ..	40·3	4·6	18·54	10	0 15 5½	228	494·5	207·06	8 14 10½
June ..	9·9	4·6	4·55	10¼	0 3 10½	238	504·4	211·61	8 18 9
				Beulah (not in calf).					
September ..	..	..	..	..	..	..	..	..	..
October ..	..	..	..	..	..	..	..	..	..
November ..	..	..	..	..	..	..	..	..	..
December ..	..	..	..	..	..	..	..	..	..
January ..	..	..	..	..	..	..	..	..	..
February ..	96·6	5·0	48·30	9¾	1 19 3	33	96·6	48·30	1 19 3
March ..	105·9	5·0	52·59	9½	2 1 11	64	202·5	101·25	4 1 2
April ..	99·0	5·2	51·48	9¾	2 1 10	94	301·5	152·73	6 3 0
May ..	72·3	5·0	36·15	10	1 10 1½	125	373·8	188·88	7 13 1½
June ..	23·6	4·9	11·56	10¼	0 12 0½	135	397·4	200·44	8 5 2
				Pennsylvania (due to calve, 16th August, 1911).					
September ..	40·0	4·1	16·40	11¾	0 16 0¾	17	40·0	16·40	0 16 0¾
October ..	75·1	4·1	30·79	11½	1 9 5	48	115·1	47·19	2 5 5¾
November ..	71·1	4·2	29·86	10¾	1 6 9	78	186·2	77·05	3 12 2¾
December ..	60·9	4·2	25·58	10¼	1 1 10¼	109	247·1	102·63	4 14 1
January ..	49·8	4·0	19·92	10	0 16 7¼	140	296·9	123·55	5 10 8¼
February ..	44·6	4·0	18·60	9¾	0 14 5¾	168	340·5	141·39	6 5 2
March ..	49·3	4·2	20·70	9½	0 14 8¾	199	389·8	159·99	6 19 10¾
April ..	47·8	4·0	19·12	9¾	0 15 5½	229	437·6	179·11	7 15 4¼
May ..	19·2	4·4	8·40	10	0 7 0	260	456·8	187·51	8 2 4¼
June ..	5·1	4·4	2·24	10¼	0 1 11	270	461·9	189·75	8 4 3¼
				Sumatra (due to calve, 18th August, 1911).					
September ..	43·6	4·5	19·62	11¾	0 19 2½	30	43·6	19·32	0 19 2½
				Dried off.					

URGENT DAIRY FARM WORK.

A WARNING FOR THE COMING SEASON.

J. S. McFadzean, Senior Dairy Supervisor.

There would appear to be every prospect of the coming summer being a bad one for dairy-farmers unless they make full use of their present opportunities. Over nearly the whole of the State the oat crops were prevented from making good growth by the excessive rainfall. Many have not stooled out at all, and are more or less overrun with sorrel and other weeds. There is thus almost certain to be a serious shortage in the hay crop. The grass also has not come on as well as could be desired; and it is now running to seed on a very short growth.

With little hay, and less grass than usual, dairymen should make sure of having as much summer growing fodder sown as possible. Maize, sorghum, amber cane, Japanese millet, pumpkins, melons, and the like, are all good summer crops; but a good variety of maize will usually give the biggest bulk yield per acre; and it is also a fodder much relished by stock when properly grown. However, some such crop should be sown at once, if this has not already been done; and later sowings may be made, with a little care in preparing the ground, even up to the end of January. At least ¼ acre per cow should be sown; and the sooner it is in the better, for it will then be available all the earlier to keep up the milk supply.

For quick maturing, the varieties of maize known as Funk's Yellow Dent, and Eclipse, may be sown first in November; while later on, and through December, the heavier-yielding Hickory King and Yellow Moruya varieties should be planted. Then, in January, the Eclipse and Dent may be sown again.

When the ground is ploughed it should not be allowed to become dry and caked on the surface; but should be kept loose with the harrows. If the land has not been well manured previously it is as well to put in a little superphosphate with the seed. The seed should be sown in rows 3 ft. apart; and not deeper than from 3 to 4 in. Putting the seeds from 6 to 8 in. apart in the rows, from 30 to 35 lbs. will sow an acre. When hand sowing after the plough, every fourth furrow will be close enough to put in the seed. In very loose or dry soil, rolling the land after sowing is an advantage, as it sets the soil closer to the seed; but harrowing after sowing is the better method in damp or loamy soils.

As soon as the crop shows through the ground the horse-hoe should be run down between the rows to loosen the surface soil again, to check the weeds, and to prevent the soil moisture from drying out. This can be repeated with advantage about every ten days until the crop is 18 to 24 in. high; but only a very light working must be given so as not to stir the soil deeply, or break the roots of the maize. A piece of brush under the scarifier will keep it from running too deep in light land; and two or three workings are generally sufficient for a crop. A cultivation should always be given after each rain. The scarifying does all that is required to keep the maize growing, even through very dry weather. It is the drill sowing and careful cultivation that will make the maize crop a success.

ANSWERS TO CORRESPONDENTS.

The Staff of the Department has been organized to a large extent for the purpose of giving information to farmers. Questions in every branch of agriculture are gladly answered. Write a short letter, giving as full particulars as possible, of your local conditions, and state precisely what it is that you want to know. *All inquiries forwarded to the Editor must be accompanied by the name and address of the writer.* This is very necessary, as sometimes insufficient information is furnished by the inquirer.

CLEARING MUDDY WATER IN DAM.—S. McC. writes: "I have a new dam, and the water in it is a reddish colour. I wish to know if you can advise me how to clear it without using lime, as the latter is injurious to vegetables and garden plants?"

Answer.—If lime be used at the rate of ½ lb. per 100 gallons of water, and mixed well by drawing a log through the water several times, no injury need be feared from using the water. If you prefer an alternative method, you may gain your object by dissolving some ordinary alum in water and adding this solution to the water in dam, at the rate of 1 lb. of alum to 500 gallons of water. See also article on "The Purification of Muddy Waters," by Dr. Rothera, published in the July, 1910, issue of the *Journal*.

THOMAS PHOSPHATE.—T. P. McL. asks whether the phosphoric acid in Thomas phosphate is always in citrate form, and also whether basic slag and Thomas phosphate are identical?

Answer.—Thomas phosphate and basic slag are one and the same fertilizer. In good samples, the greater portion of the phosphoric acid is soluble in citric acid. Thomas phosphate is an imported fertilizer, and is not manufactured in Australia. The fertilizer is a by-product resulting from the manufacture of steel. The total phosphoric acid content is approximately 17 per cent., of which at least 14 per cent. is citrate soluble.

HOME-MADE BONEDUST.—J.D.F. inquires as to method of making bonedust in a barrel.

Answer.—Bones and fresh wood ashes are placed in alternate layers, making the first and last layer of ashes, until the barrel is full. The whole is kept slightly moist. After three or four months, the mass may be turned over once a month for three months, when it will be ready for use. Another method is to mix them with quarter of their weight of clay, keeping the whole moist with urine or stable liquor for three or four months. A third method is to place the bones in the barrel with a layer of soil at the bottom, and drench them with a hot solution of lye, mixed in the proportion of 1 lb. potash lye to 4 lbs. bones. This should be covered with soil and stirred occasionally for four or five weeks. The mixture may then be turned out to dry.

FRENCH GARDENING.—J.D.F. asks whether French gardening has been practised in Victoria.

Answer.—Not so far as is known. This method of vegetable growing is unnecessary in Victoria, owing to our suitable climate, except for forcing such plants as asparagus, kale, and various salads in small quantities.

BAMBOO BLINDS.—J.D.F. asks what use in the garden can be made of old bamboo blinds?

Answer.—They can be fastened to a light framework of oregon and used as screens and breakwinds. If in a sufficient quantity, they can be utilized with the framework for ferneries, plant sheds, shelter sheds, &c., and also for growing creepers upon. If fruit-drying is carried on, they make an excellent basis for the trays.

RHUBARB.—E.G.N. states that, four years ago, he planted some giant rhubarb. At first, the stalks were as thick as his wrist, but they have since greatly deteriorated in size.

Answer.—As rhubarb is a gross feeder, annual dressings of stable manure should be given each autumn; also give the plants a light dressing of bonedust and blood manure in the early spring. The beds must be well drained. See article on "Rhubarb Cultivation" in the December, 1907, issue of the *Journal*.

COW PEAS.—J.W.S. asks whether Cow Peas are of any practical value as fodder for dairy cows, or as for soil renovation?

Answer.—Cow peas grow well in any district with a fair rainfall, during summer months. They are useful for fodder if fed with other foods, and for silage if mixed with oats or rye. Silage made from cow peas alone is liable to become slimy and disagreeable to handle. As a soil renovator, they are very valuable; being legumes, they store nitrogen, and when ploughed in have the effect of adding humus to the soil.

REMINDERS FOR DECEMBER.

LIVE STOCK.

HORSES.—*Stabled Horses.*—Over-stimulating and fattening foods should be avoided. Give water at frequent intervals. Rub down on coming into the stables overheated. Supply a ration of greenstuff to all horses. *Brood Mares.*—Those with foals at foot should be well fed. *Early Foals* may, with advantage, be given oats to the extent of 1 lb. for each month of age daily.

CATTLE.—Rugs may now be dispensed with. Supply succulent fodder. Milk should be given at blood heat to *calves.*

PIGS.—*Sows.*—Supply those farrowing with plenty of short bedding in well-ventilated sties. Those with litters old enough may be turned into grass run. *All* pigs should be given a plentiful supply of clean water.

SHEEP.—To insure even lambing, see that a sufficient number of rams run with the ewes for six weeks. In cases of non-pregnancy, this period admits of the ewes coming in season a second time whilst with the rams. Merino and fine come-back ewes have been in season for some weeks, whilst cross-bred ewes (*i.e.* first cross) will now begin to come on. Coarse three-quarter bred ewes, and those approaching any of the British breeds, will not be in season until February. Ewes carry their lambs for five months.

POULTRY.—Add a little peameal to morning mash, and give less bran. Feed equal parts wheat and short white oats at night. Supply plenty of green food—at this time, lettuce is invaluable. Discontinue salts and condiments. Avoid salt meat of any description. Put Douglas mixture in drinking water. Keep ample supplies of sand, ashes, &c., in pens, and moisten same. This will enable the birds to keep themselves cool and clean. Top off geese, ducks, and cockerels for the Christmas markets.

CULTIVATION.

FARM.—Cut hay in late districts. Cut oats and barley in early places. Finish planting potatoes. Put in late maize for fodder, also millet and imphee. Plough fire-breaks where required. Get stackyard and stages ready for hay.

ORCHARD.—Keep the surface loose and free. Suppress weeds. Spray as often as necessary for codlin moth and pear slug. Mulch and spray young trees and grafts with water in the early morning during hot weather.

VEGETABLE GARDEN.—Keep the surface hoed, and allow the plants plenty of moisture. Stake, pinch out, manure, and water tomatoes. Pinch back long runners of pumpkin and melon family. Sow autumn and winter varieties of cabbage and cauliflower. Plant out seedlings in cool weather. Sow French beans. Cease cutting asparagus beds, and top-dress with manure.

FLOWER GARDEN.—Plant out dahlias for autumn blooming. Lift and store spring flowering bulbs. Stake, tie, and train growing plants. Sow zinnias and asters. Layer carnations, camelias, daphnes, &c. Water well and keep the surface loose.

VINEYARD.—Inspect young grafted vines (field or bench) and carefully remove any scion roots. Tie up young vines. Beware of cut worms on young vines—See *Journal* for July. Tying up of bearing vines, if practised, should be completed early in month. Avoid excessive and indiscriminate topping, far too frequent in Victoria. Scarify, if soil is not sufficiently loose, and after heavy rain. Look out for oidium and repeat sulphurings on first appearance of disease.

Cellar.—Fill up regularly and keep cellars as cool as possible.

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PROFITABLE DUCK FARMING.

H. V. Hawkins, Poultry Expert.

Of late, more attention has been paid to the production of eggs than to the raising of table birds. Consequently, there has been, and is now, a great scarcity of good edible poultry. The craze for egg production has increased enormously; and, as prices are maintained, it would appear likely to continue. It is now recognized that the majority of poultry breeders have set their minds to further improve the laying qualities of their birds, few apparently regarding the table fowl or duck with favour.

Thirteen years ago there was, in Victoria, much thought and writing about duck raising for profit, and many, attracted by statements regarding the great profits that were to be realized much more quickly than with hens, embarked in the business. The high price of oats, wheat, &c., however, raised the cost of feeding to such an extent that prices then ruling, especially for ducks, did not recompense the breeder sufficiently, and, consequently, the industry suffered. But, with an easier food bill, and the universal use of lucerne chaff, which has now become such an important part of the meal, it is being revived. There is no reason to doubt that good prices will be the rule.

Capital Required.

To commence operations, one has always to consider the locality, its suitability and nearness to market; the period of the year; and, above all, the cash at his disposal. There is no doubt that, as between chickens and ducklings, the cost of equipment in the latter business is less; for instance, the pens and dividing fences need not be more than half the height required for fowls. A greater number of ducks may also be kept together without risk of the catarrhal ailments common to fowls when overcrowded. Again, they mature in less than half the time, so that the returns are quicker. There is little or no vermin to cope with, as hen mites will not live upon ducks; this also means less labour.

To establish a farm capable of accommodating about 120 ducks the outfit necessary would be approximately:—

	£	s.	d.
Timber	5	0	0
Wire netting (24 in.)	2	0	0
Galvanized iron	3	0	0
Nails, catches, hinges, and sundries for pens	1	7	6
Incubator (120 machine)	7	0	0
Brooder (home made)	0	17	0
Pen of breeding ducks—1 Aylesbury drake, 4 Pekin ducks ...	2	10	0
Tank for breeding pen	1	0	0
	22	14	6

In a word, an expenditure of less than £25, apart from rent or interest on capital invested in land, will be sufficient for a person willing to make a modest beginning in this business: but he must be able to keep himself for the first year, as the returns for the first six months will be required to erect additional pens to accommodate the increasing number of birds.

Location.

In order to be successful careful consideration must be given to the selection of the site. Much depends on aspect, soil and drainage. Select a site which has an easterly aspect and slopes somewhat so that the early morning sun may sweeten the ground. Sandy soil is the most suitable for ducks. Hard or stony land must be avoided, otherwise the ground becomes sour; moreover, as ducks have somewhat tender feet they are liable to corns, and consequent lameness. What is known as "bumble feet" is largely due to the presence of heavy clay or stony land. As ducks do not, as a rule, respond to treatment, one has to guard against the ills to which they are heir.

Shelter Trees or Hedges.

Shade in some form is indispensable for all poultry, exposure to heat causing great mortality. Tree Lucerne thrives well on sandy soil. It is best to keep the tops cut in order that the growth may be more regular, and at the same time prevent the trees from becoming useless for the purpose intended.

It is advisable to provide temporary shade until the trees have grown sufficiently. On no account should Box Thorn or any other hedge of a thorny character be planted; neither should ducks be permitted near such plants, as foot troubles rapidly follow.

Housing.

There is not the slightest need to erect costly houses for ducks. They merely require a safe and dry shed, free from rain and not exposed to wind, and ample dry litter—straw, pine needles, or any soft material.

Concrete, asphalt, or bricks make good serviceable floors. They are easy to clean. First use an ordinary scraper; and then, if found necessary, give the floor a good hosing. When the floors are dry, and prior to the night meal, provide bedding material.

Ducks should not be confined in warm or ill-ventilated houses, as those artificially reared are more subject to cramp and leg troubles. It is most important that both houses and bedding should be thoroughly aired daily.

A floor space of 8 ft. x 6 ft. is ample for 25 matured birds.

Size and Height of Pens.

A pen 40 ft. x 20 ft., if properly looked after, will accommodate 25 birds. The height of the wire need not be more than 3 ft., even a 2-ft. division will suffice; but a wide mesh is necessary, as too often, when a narrow mesh is used, birds are strangled—they get their heads through and are unable to withdraw. Three-inch wire mesh is cheaper and much safer.

Ducks cause little worry in penning. They are far more contented in confined runs than are fowls, and do best in lots of not more than 25, as they have a bettter chance of securing their fair share of the mash.

Selection of Stock.

When the pens and houses are complete, select the stud birds. If inexperienced, seek advice, otherwise serious mistakes may be made at the outset. The stock birds should be selected both for size and egg production. It would be utter folly to breed from what are termed "Puddlers," weighing from 3 to 4 lbs. live weight.

Large well-formed stock should be purchased, two years old for preference; the drake should never be less than nine months and *unrelated*. Should one have only young ducks, then secure an older drake. This class of stud birds will produce large and quickly-maturing ducklings weighing, when ten or twelve weeks old, 12 to 13 lbs. per pair.

Much depends upon the feeding, and ducks require forcing to get them up to this weight. If the ducklings are scantily fed, they will be stunted in growth, and at ten weeks will not weigh 8 lbs. a pair. This is important, for after eleven weeks they commence to throw off the downy feathers and their growth is checked immediately. The food given for the next four weeks is merely utilized in the production of the adult feather at the expense of the body, and much of the profit is lost. Keep them growing as fast as you can, so as to secure the desired size before the youthful feathers give place to the adult quill feathers. The poulterer prefers to pluck the young feathers; the work is easier, and there is less likelihood of tearing the skin.

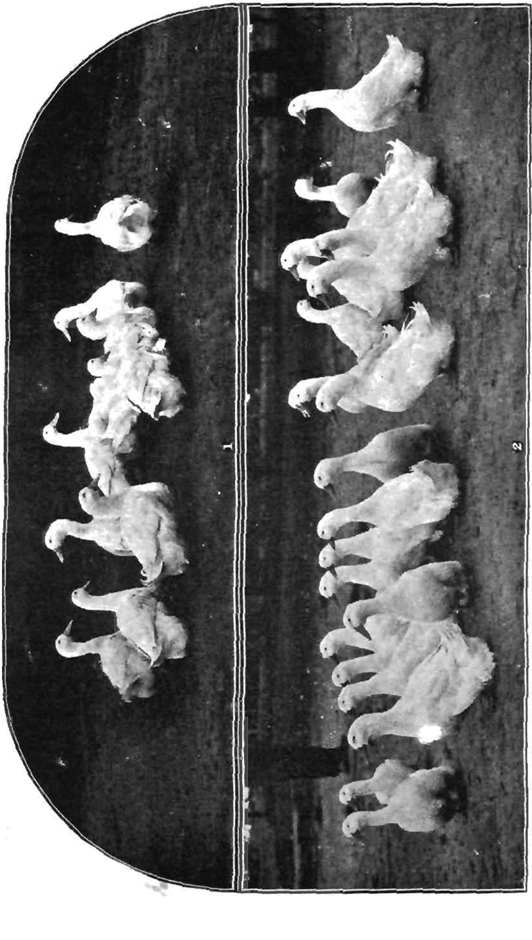
Water, Grit, Etc.

Ducks that are kept for egg production should not be allowed free access to creek or dam. Eggs or flesh is wanted; and, if the birds are constantly swimming and drinking, the food passes through them too rapidly. But it must not be thought that ducks only require a drink once or twice daily. Clean water should always be kept in a shady spot, and the drinking vessel should be 7 or 8 in. deep, sufficient for them to dip their heads well in and to enable them to wash out their eyes—a shallow receptacle is useless. Coarse sand should be put in the water; the ducks enjoy it, and it is good for them.

Crushed oyster shell, and pieces of broken-up mortar are the best forms of grit, and assist in the making of the egg shell. Powdered burnt lime, cinders, and charcoal are also good for the purpose. Ducks consume much more grit than fowls, and they prefer old mortar to anything else.

Eggs.

As the first five eggs laid are usually infertile, they should be used for culinary purposes; reserve the subsequent eggs for the broody hen or



1. MAMMOTH AYLESBURYS; THE PERFECTION OF TYPE AND COLOUR. 2. HUGE PEKINS, UNDER TEN MONTHS O.D.

the incubator. On no account part with the early eggs, if you desire to work up a flock, both for size and constitution, as from these can be reared the best ducklings. The successful breeder usually retains the first dozen from each duck—most of the champions at the Poultry Shows come from the early eggs.

The longer a duck lays the weaker becomes the germ; hence the necessity of hatching early for best results.

July, August, and September are the best months in this State. For example, the first batch of Aylesbury eggs laid by four ducks (which number is quite enough with one drake in a breeding pen), on one farm last season was kept and incubated, the result being that the ducklings at seven weeks weighed, on the average, $5\frac{3}{4}$ lbs. each—a splendid result; while later batches at the same age did not reach $4\frac{1}{2}$ lbs.

When the farmer is anxious to breed a large batch of young ducklings from the one pen, a good plan is to change the drake. This would, to a large extent, keep up the stamina and size of the youngsters all through the season.

UTILITY DUCKS.

Much has been written of the various breeds, and possibly too much with regard to their origin. The farmer cares little whether Pekins came from the Eastern World or from America; what concerns him most is which breeds will command top prices in this State. There is no doubt that the Pekin, Aylesbury, and Muscovy breeds are amongst the best. They are large meaty birds, and rapidly respond to fattening foods. They may be bred pure or crossed, the latter being preferable. A first cross increases the fecundity, there are fewer infertiles, and stamina is added.

MODES OF CROSSING BREEDS.

Select four Pekin ducks, second season preferred, and an Aylesbury drake nine months old, not younger. They should be mated early in June. July, August, and September are usually the best months for laying, and the eggs are more fertile than later in the season. When ducks have access to water the eggs are found to be more fertile. They should, therefore, have a swim for twenty minutes each morning and evening during breeding time.

Where there is no natural creek, an iron tank cut in half and let into the ground will be sufficiently large for them. It should have a plug and an outlet pipe, and should be cleansed twice a week. Take care to have a sloping foot-board, nailing pieces crosswise to prevent slipping, as injuries are frequently caused by this means.

This cross—the Pekin and Aylesbury—will produce beautiful white flesh and plenty of it.

Quite recently a big demand has set in for the Muscovy cross. This is best produced by having four Muscovy ducks mated with a vigorous Pekin drake. It will be found preferable to using the very heavy Muscovy drake, and the fertility is surer. Latterly, 10s. to 12s. per pair have been paid for this cross.

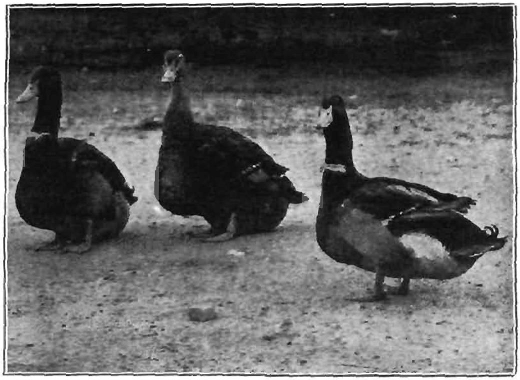
FEEDING BREEDING DUCKS.

When breeding ducks are penned in yards, they get little or no insect life; and in most cases the grass soon becomes tainted and sour. It therefore becomes necessary to provide adequate foods wherewith to produce eggs strong in the embryo.

A one-sided ration will not suffice. Nitrogen (meat), mineral salts, vegetables, with a fair amount of carbo-hydrates, are all requisite. Then again, coarse sand, mortar, burnt bone, and crushed oyster shells must be available at all times; otherwise soft-shelled eggs will result.

A good ration is formed by equal proportions of pollard, barley meal, and bran; and about one-third of lucerne chaff (scalded over-night); with half an ounce, for each adult bird, of minced animal food, such as ox liver, beef scraps, or rabbit. Twice a week add finely chopped raw onions. The meat should be boiled over-night, the soup being used in mixing the whole to a crumbly consistency. A little sand and ground oyster shell may be added to the meal occasionally. The less moisture there is in the food the better.

Occasionally give a little grain at night, but not more than three times a week—on alternate nights. Many duck breeders prefer giving soft food only.



ROUEN DUCKS.

It is not advisable to make drastic changes in the diet. Instances are on record where pea-meal and bran have been given with bad results to a flock accustomed to having pollard, bran, potatoes, &c. The safest change of food is that of two parts maize flour, one part rice meal, and one part bran, with the vegetables and meat added as before.

Ducks are naturally insectivorous. They haunt creeks, working through the mud, seeking water insects, worms, &c. Therefore, in a breeding-pen, they must have double the quantity of animal food that fowls require.

Breeding Pure Stock.

The Rouen is perhaps the most perfectly marked duck in existence; but from a utility point of view it is not comparable with those already referred to. Neither does the colour of egg—green—appeal to the public. The Rouen certainly has been successfully crossed with Aylesbury and Pekin for market purposes.

The Aylesbury is very popular in Australia. Birds of this breed mature quickly, and lay a nice white-shelled egg, usually commencing in May when the average hen is resting. Their eggs thus command excellent prices during the period of greatest scarcity.

For the benefit of those who cannot determine the Aylesbury from the Pekin, the following descriptions are given. The illustrations will also be helpful.

Characteristics of the Aylesbury.

Head:—Long and straight. *Bill:*—Long, broad and strong. The head and bill measure from 6 to 8 in., and are well carried on a fairly long neck of medium thickness and slightly curved. *Eye:*—Dark and full.

Breast:—Full and deep, with good girth. *Keel:*—Very deep; quite straight and extending from just behind the legs to breast. *Back:* Long and broad.

Wings:—Strong, and carried close to the side.

Tail:—Short, and slightly elevated. There are two or three curled feathers in the centre of the drake's tail.

Legs and Feet:—Very strong and thick in bone; well set, so as to evenly balance the body. *Toes:* Straight, connected by the web. *Plumage:*—Pure white throughout; bright and smooth.

Shanks and Feet:—Bright orange.

Size and Weight:—The larger the better. The drake at six months should weigh not less than 9 to 10 lbs.; a duckling not less than 8 to 9 lbs. Young Aylesburys when well fed, reach 7 lbs. live weight in about twelve to thirteen weeks. In the second year, and afterwards, the duck should equal the weight of the drake (between 10 and 11 lbs.).

Characteristics of the Pekin.

Head:—Large with broad and prominent skull, rising abruptly from base of bill. *Bill:*—Short, broad, and thick; slightly convex; bright orange colour, free from black spots or streaks. *Eye:*—Dark leaden hue, and partially shaded by heavy eyebrows. *Neck:*—Long and thick; carried well forward, and well arched.

Body:—Medium length and broad. *Breast:*—Wide and prominent, and descending even, solid and uniform from girth to paunch. No indication of keel. *Paunch:*—Broad and to end of tail, forming a half circle when standing erect. *Back:*—Broad.

Wings:—Short and carried close to the sides.

Tail:—Well spread and carried high. The drake should have two or three curled feathers on top.

Legs and Feet:—Strong and stout, set far back, causing erect carriage.

Shanks:—Bright orange. *Toes:*—Straight, connected by web.

General Shape and Carriage:—Almost upright in appearance; elevated in front; sloping downwards towards the rear.

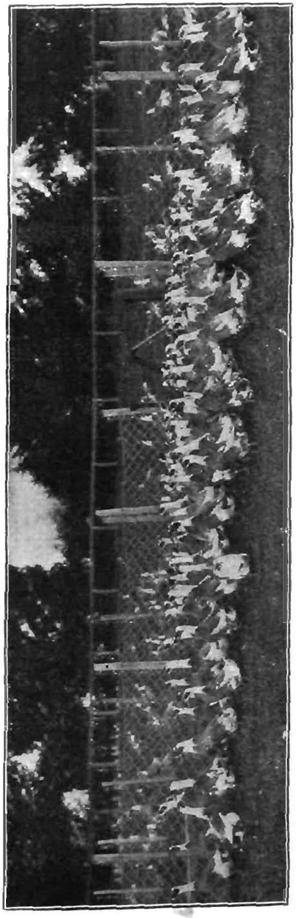
Plumage:—Deep creamy white colour throughout; plenty of it, with soft, downy feathers on thighs.

Size and Weight:—Drakes from 8 to 9 lbs.; ducks from 7 to 8 lbs.

INDIAN RUNNERS.

Whilst recognizing the value of the Aylesbury and the Pekin as the best all-round purpose ducks, the Indian Runner has the prior claim for egg production. It is quite a common occurrence for many to lay 240 eggs in the year.

The birds of this breed are small; the drakes weigh from 4 to 5 lbs., and the ducks a little less. The plumage is close and tight, giving them that



INDIAN RUNNERS—200 BIRDS.

racy appearance. The head is flat, the eye quite close to the scalp, and the head very fine and long; on the scalp there is a dark cap giving it a piebald appearance. The bill is thick at the base and long and wedge-shaped; it is yellow when hatched, gradually becoming green; the drake's bill is of a more yellowish tint than that of the duck. The neck is long, white, and decidedly thin; so also is the body. The under part is white up to the coloured breast; whether fawn or grey, the colour should be uniform. The back reminds one very much of the saddle-back pigeon with its heart-shaped patch reaching to the tail, the tail portion being coloured. There is no appearance of keel on the breast, and the bodies are almost upright. The legs are set well aft, the same as those of the Pekin, and are somewhat fine-boned and orange red in colour. There is a diversity of opinion regarding plumage. Some claim that fawn is correct; while others, grey.

Indian Runners cannot be classed as market ducks. They are too small; and, if over five months old, lack the juicy flavour that is found in the Pekin-Aylesbury cross. It is not uncommon to have them laying at seventeen weeks. They thrive best when given a fair amount of room in which to seek insect life. Especially when in pens, they should be provided with a fair quantity of animal food. They are not big eaters by any means; but what they do get should be highly nitrogenous, failing which the yield of eggs is much diminished.

Water, not necessarily running, is an indispensable item.

A small dam or tank will suffice Allow them access to it at least once each day.

Five to six ducks are sufficient for one drake, which should be of another strain.

The eggs are usually white; but of late they show signs of having had an introduction of foreign blood, presumably Rouen, which has resulted in their laying (sometimes) a greenish-coloured egg. The size of the egg is on a par with that of the average Leghorn, *i.e.*, about 25 ozs. to the dozen; the flavour is decidedly good. Unfortunately, their eggs, like those of all other water-fowl, are not satisfactory when placed in preservatives or cold storage. Thus, duck farmers are somewhat handicapped when distant from local markets.

Continued inbreeding cannot be too highly condemned. It results in infertility; in many cases in leg weakness, and in a gradual falling off in the number and size of eggs laid. New blood is necessary at least every second year.

Incubation.

When hatching ducks in a large way incubators should be resorted to, as it is almost useless to attempt to use the duck, and broody hens are often difficult to secure when wanted. The eggs will not keep so long as those of the hen, being more porous.

The best incubator is the celebrated English (Hearson's) pattern. It has the tank, and being so perfectly ventilated allows free interchange of gases. Hot-air machines, especially with duck eggs, are not as successful as tank machines. Many failures in this State have been found where the hot-air machines, lacking a moisture tray, have been used, the trouble being that the ducklings die in the shells.

In a report of the Biological Division of one of the Experimental Stations in the United States of America appears the following dealing with the moisture question:—

> An attempt has been made from the beginning of last year's experiments with hot-air machines to render the moisture factor as uniform as possible. To effect this the concrete floor of the basement has been constantly *kept wet*. A constant supply of water was thus exposed to the atmosphere of the room. The air was much improved by this constant wetting in so far as its respirability is concerned.

This being so, surely it is folly to attempt duck-raising in Victoria with hot-air machines without the moisture-tray. The Victorian-made tank machines are more than equal to any of the imported makes, and this is especially so in regard to their incubation of duck eggs. Further proof is given from New South Wales, where six machines were tested, two of local make and four imported, the results being—Australian, first and second; and American, last.

Temperature for Duck Eggs.

Duck eggs require a little less heat than hen eggs—102½ deg. is about the right temperature. They also need more moisture as hatching time approaches, but not before. The moisture tray should be placed in machine seven clear days prior to hatching, *i.e.*, after twenty-one days. Twenty-eight days are required for hatching most breeds of ducks, though Muscovies take five weeks. It is absolutely necessary to turn the eggs at least twice each day—after the third day.

The cooling of the egg-drawer is beneficial to the embyro. The last seven days the egg-drawer should be cooled daily for at least fifteen minutes—many successful breeders cool them up to thirty minutes—but

when the eggs are chipping the egg-drawer should not be interfered with, except to turn the chipping side upwards. Never sprinkle the eggs.

Setting Duck Eggs under Hens.

If duck eggs are set under a hen the less straw or nesting used the better; in fact, by setting on the ground the best results are frequently obtained. The use of boxes, especially in a dry atmosphere, should be avoided. If moisture is neglected, the lining membranes will become like parchment, and will in many cases stick to and dry on to the young mites not yet out of shell, and the result is that they die in the shell.

Dry Nests.

If the nest appears too dry, and the hen neglects to dust herself in a cool spot, slightly damp the outside of the nest. Cases have been known where the nest has been flooded by heavy rain, and the eggs partially under water, and yet nine out of eleven have been hatched and reared successfully.

Hatching Ducklings.

When hatched, the young should be left under the hen until thoroughly dry and strong enough to stand. Many are lost through being removed too early from the nest. In a few days, three or more broods may be put together under one hen; she will be quite able to take care of them. Never allow them access to creek or pond, but keep fresh water by them for drinking purposes. Put a little sand in drinking vessel. They require no food for quite twenty-four hours, but *water must always be available.*

First Few Days' Meal.

This should consist of hard-boiled egg mixed with a little boiled rice, and liver cut up very small, and should be given several times daily. Occasionally change the rice to oatmeal. When ten days old, give barley-meal one part, pollard one part, and a good portion of fine meat scraps and raw onion. A little dry bone-meal is beneficial, and assists to build up their frame. Onion tops are an excellent green food; mix in the mash. Coarse sand must be added to the water, otherwise digestive disorders will follow.

Then feed largely on barley-meal, a little bran, with plenty of skim-milk, liver, and lucerne chaff; occasionally add finely-chopped raw onion or tops. If intended for market, they should not have any grass during the last fourteen days, as it discolours the flesh.

General Reminders.

(1) Do not attempt to catch the ducks by their legs. It is much safer to handle them by the neck.

(2) Do not reduce their weight by taking a lamp amongst them at night.

(3) Never throw dry lime in a duck pen; it kills.

(4) Never select the largest duck eggs for hatching; they are usually infertile.

(5) Never set a hen on duck eggs in a dry shed unless you moisten the nest twice each week.

(6) Always provide plenty of carbonate and phosphate of lime to assist shell-making. Oyster shell supplies this need.

(7) Keep plenty of coarse sand and old mortar, and a little charcoal in a box for laying ducks.

(8) Keep ducks away from creek at night-time, otherwise many eggs will be lost.

(9) Ducks should always be locked in at night, and kept on an absolutely dry, soft floor. They lay best under these conditions, and the eggs are easily gathered.

(10) To breed healthy ducklings, avoid the heavy, fattened show birds which lay but few eggs; even these are usually infertile.

(11) Never hurry the laying ducks. It usually injures them; sometimes seriously. When handling ducks, never hold them by the wing.

(12) When sickness attacks ducks, it is useless to doctor them. The best remedy for duck ailments is plenty of sliced raw onion in the mash, and an absolutely dry, soft bed.

(13) When Runner ducks for egg production are desired, have four to five ducks with an unrelated drake; two ducks and one drake usually produce too large a percentage of drakes.

(14) From the beginning of July to the middle of September is the best time to secure the strong embryo germ

(15) Ducks for market should be fed well; feed as much as possible —up to ten weeks. They pay best when fattened before they commence to shed the young feather.

(16) Grain is best scalded or placed in the water vessel. The safest time for grain meal is midday, and then not more than three times each week.

(17) It costs 2½d. for each 1 lb. of duck flesh at thirteen weeks.

(18) Ducks should never be permitted to run with fowls. They both do better in pens by themselves.

(19) When fowls and ducks are allowed to drink from the same vessel, an outbreak of disease may be expected.

(20) Birds with crooked backs, wry tails, and similar defects should not be bred from.

FARM BLACKSMITHING.

(*Continued from page 743.*)

George Baxter, Instructor in Blacksmithing, Working Men's College, Melbourne.

V.—WELDING.

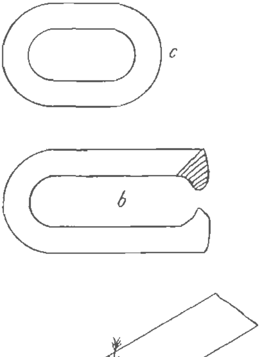
The fact that iron can be joined together by heat and pressure alone, without loss of strength, makes it far more valuable than it otherwise would be. It likewise affords the smith ample opportunities of displaying his skill and ingenuity.

Welding is undoubtedly the most important part of the blacksmith's art, but one who possesses any talent at all is not likely to be unsuccessful, if he has a forge, fuel, and iron of any size and shape. He could, for instance, make a bolt or hinge out of old horseshoes, tyres, or parts of any old machine, simply because iron can be welded. Small bars can be made into pieces of larger section, by doubling the bar over and over until a sufficiently large lump is made and then raising to a welding heat and hammering down. Steel can be joined to iron, as in the case of re-pointing ploughshares, picks, crow-bars, &c.

The importance of being able to make a good weld will be manifest, and at first one must be prepared to meet with failure, which is almost inevitable. Patience, perseverance, and practice are important factors that conduce to success.

Consideration requires to be given to the following rules:—

1. That the parts to be welded are properly prepared. This is called *scarfing*.
2. That the fire is free from clinker, and that there is a sufficient body of fuel to insure reaching a high temperature.
3. That the metal is raised to the proper heat without burning, and that the surfaces to be joined are free from dirt.
4. That the parts are laid together in the proper position.



39. WELDED LINK.
a. Showing position on anvil ready for scarfing.
b. Scarfed ready for bending the ends.
c. Finished link.

WELDED LINKS.

About the simplest form of weld is in a link for a chain. It might be supposed that, after the description already given of how to make a split-link, the same procedure, plus welding, would be observed in making a welded one. Although a link may be made by that method, it would not be according to the orthodox style of doing it, neither would it be the best.

To make the link in question, a piece of round iron is cut to the required length. The length is found by the same method as in the case of the split-link, but a greater allowance requires to be made for waste and compression in welding than in pointing. A common rule for this is to add on one thickness of the bar. For instance, if it were required to weld two pieces of iron 1 in. thick together, so that the finished length would be, say, 12 in., then the combined length of the pieces before welding would have to be 13 in. This rule applies equally to round, square, or flat bars.

After cutting the pieces to the required length a beginning is made by heating the central portion of the piece and bending it to the form of the letter U, making the internal breadth equal to the finished link. Next *scarf* the ends for welding. The object of scarfing is to arrange the ends so that, on being heated, the union is completed in the shortest possible time; also, to make the weld invisible, and to have that part as strong as the rest of the bar.

There are various ways of scarfing iron and steel, each according to the nature of the weld and to the material. The scarf used for the link is called a *lap-scarf* and is the most common. It is used for welding straight bars of iron or mild steel—for rings, links, &c.

Fig. 39 shows the link in its various stages. To accomplish the scarfing, hold the semicircular end in a pair of tongs, heat to bright red, and place on the anvil in the position shown at *a* in Fig. 39. Strike, as indicated by arrow, with the hand hammer. After each blow, move the link slightly nearer to the beak of the anvil in such a manner that the underneath side will be sloped off to a thin wedged point, by a series of small steps. The link is then turned over and the other end treated the same. Each end is then bent over the beak of the anvil, so as to form to the shape of a completed link with the scarfed ends overlapping each other until the sectional areas of both taken together are greater than the section of the bar. This increased size is necessary to compensate for the loss due to heating and hammering.

It is important that the scarf be hammered together so that no space exists between them. If any opening were left, dirt from the fire would get in and prevent a successful weld. It must be borne in mind that under any circumstances, welding is only permissible when the clean surfaces of the metal are brought together at a suitable temperature. Although the welding heat has been required before in making a point on the end of a poker, it will be found that welding two separate pieces together is a much more difficult operation than pointing, so greater precautions need to be taken to have the fire clean, *i.e.*, free from clinker.

To obtain the heat, the fire should be blown sharply, and immediately the correct temperature is reached the work should be removed to the anvil and the hammer brought into play. Welding the link is done by first striking the scarf together on the flat surface of the anvil and then on the beak, and so on alternately until completed. Care should be taken not to hammer the weld smaller than the original bar; in fact, it is always safe to leave the welded section slightly larger than the bar, to allow for any loss that might be due to welding.

All this work is done more quickly than the time occupied in writing a description of it. As a matter of fact, it would be impossible to adequately describe the various movements and the effect of the blows struck. It would be folly to say that so many blows should be given in one place, and so many in another, because the heat, amount of lap, and size of material, are each factors in determining that. Nothing but practice will lead to good results.

If two or more links require to be joined together, each succeeding link is first scarfed and then put through the one previously finished and afterwards bent into shape and welded. All welded chains are made in this manner, no matter how long they may require to be.

When a link similar to those in a tug-chain or back-chain is required, it is first made according to the directions given for a straight one, and afterwards made red hot all over, when it can easily be twisted with two pairs of tongs or in the vice.

Hinges.

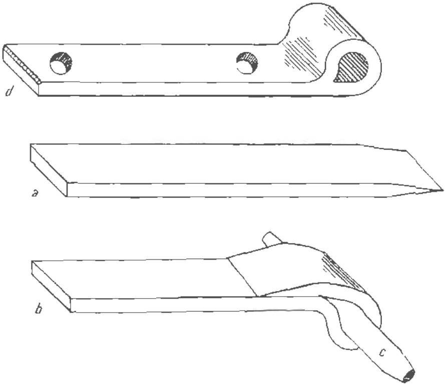
Fig. 40 shows a very simple and, at the same time, useful hinge. It would be suitable for a stable, fowl house, or barn door; or for a gate.

The method of making this is to take a flat bar, the size of which will have to be decided upon according to the weight and size of the gate or door, and scarf wedged shaped as shown at *a*, then bend as shown at *b*. The end is next bent around the beak of the anvil to form the eye In order to get the eye of the right shape and size, a *drift* (*c*) is used. It is a circular piece of iron or steel, preferably steel, forged to the shape shown. After bending on the beak, the hole is irregular and by driving

the drift into the hole and beating the hot iron all around, it is forced to the proper size and shape.

When obtaining the welding heat, care must be taken to turn the work over frequently to prevent the dirt sticking to the top side. The effect of this would be to burn small holes in the metal, so that a good finish could not be produced. The scarfed side should be downwards just prior to removal from the fire, in order that it may have the greatest heat at that part.

In working on the anvil, the thin edge of the scarf should be the first part struck with light and quick blows, and then heavier and slower blows on the thicker portion of the weld. By this time, the temperature will have fallen below the welding point; but if the scarfing, heating, and hammering have been correctly done, the union should be complete. After welding, the iron is rough, irregular in section, and scaly, and requires to be correctly shaped and finished.



40. HINGE.

a. First operation—scarfing the end. *b.* Second operation—preparing the weld. *c.* Drift. *d.* Finished hinge.

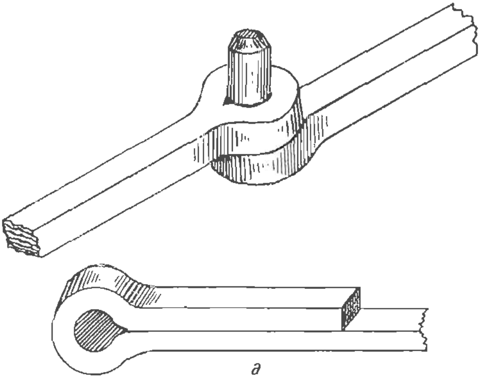
For finishing work of this description, the scales should be removed with a file and the anvil brushed clean previous to using the flattener for smoothing and straightening the work. If the face of the anvil and flattener be wetted with water during the finishing operations, a much cleaner job is the result. The effect of the water on the heated iron, when compressed as by a blow, causes a rise in temperature which generates steam, and the result is that an explosion takes place and the steam and small particles of scale are ejected and the surface of the iron is left very smooth.

Fig. 41 shows another form of a simple pair of hinges, used chiefly on gates. They will permit the gate opening either way, and can be so hung that it will close of its own accord, providing that a suitable catch is made. It is an advantage to hang a farmyard gate in this manner;

on riding to a gate, there is no need to dismount to either open or shut it. It can be opened with one foot and pushed forward, so that the rider can continue his journey knowing that it will close of its own accord.

The process of forging the top part requires but little explanation, as it accords very closely with the method described in the previous case. The difference is that the eye is in the centre, and that the ends are doubled together, as shown at *a*; also, that the welding heat is taken right along and is made square in section instead of oblong. In some instances, the end is pointed for driving, and in another it is rounded and a thread cut on it with the dies. The latter is the best, but requires more work. The driving hinge would be used on a rough hardwood gate or post, whilst the screwed one would be most suitable for soft wood. It would be unwise to drive into the soft wood, on account of splitting.

The part with the pin attached is a little harder to make. Up to the welding heat, it is the same as the top part, but having got that far, a



a

41. GATE HINGE.
a. Ready for welding.

piece of round iron is driven tightly into the hole and allowed to project through on the bottom side from about $\frac{1}{8}$ in. to $\frac{1}{4}$ in. The heat is then taken. On removal from the fire, the first blows should be struck with the object of welding the part adjacent to the pin. It is then re-heated to welding *heat*, and the pin is quickly put through a *bolster*—a piece of iron with a hole drilled through it slightly larger than the diameter of the pin—and smartly driven down with the hammer. The short projecting piece is thus spread out over the surface, like a rivet, and at the same time is welded, making it impossible for it to fall out.

(*To be continued.*)

AGRICULTURAL CREDIT BANKS.

A. T. Sharp, Editor.

Consequent on the inauguration and development of the Closer Settlement Policy of the Victorian Government, communities of settlers whose aims and aspirations are much in common are being created throughout the State. The fact that the settlers on each estate are united by interests in common should tend to largely develop co-operative ideas amongst them. The butter industry, which has assumed such colossal proportions in Victoria, is the outcome to a great extent of the formation of co-operative butter factories in the country districts. Whilst co-operation has in this respect proved its worth as a developing agent, there are numerous other avenues whereby the producers may benefit themselves, and also the State, by the application of its beneficent principles. Not the least important is that of credit banking.

In Great Britain, the useful part which credit banks may play in the successful cultivation of small holdings has been recognized by Parliament in the Small Holdings and Allotments Act of 1907. The County Councils are given power under the Act to promote the formation and extension of credit banks. With the consent of the Local Government Board, they may also assist such societies by making grants or by guaranteeing advances made from other sources.

Although Victoria is comparatively well served by the various banks and other institutions, as far as the farming community is concerned, settlers often require temporary financial assistance, such as would not justify them making application to any of the recognized sources. For instance, a plough or an additional cow may be wanted. The amount involved is comparatively small, but the settler has not the money available. At the same time, if he were a member of a local agricultural credit bank, practically a mutual self-help society, his credit would be sufficient to enable him to obtain a loan at a reasonable rate of interest; the expenses incurred would be easily met by the increased productiveness of his holding. The credit bank is not a competitor with the larger financial concerns, but is an aid to them. At all events, that has been the experience in other lands. Its clients are, as a rule, persons whose capital is but small, and whose requirements are limited.

Origin and Growth of Credit Banks.

Co-operative credit had its birth in Germany, but it has since spread throughout the continent, to Great Britain, India, Canada, and Australia. The Co-operative Credit Bank of Victoria, Limited, which will be referred to later, is the pioneer of the movement in the Australian Commonwealth. The following figures, showing the number of banks in 1909 in various countries, will give some idea of the growth of these credit institutions:—

Germany ...	15,158	Servia ...	615
Austria ...	9,068	Belgium ...	568
Russia ...	8,574	Ireland ...	268
France ...	2,983	England ...	39
India ...	1,766	Canada ...	31
Italy ...	1,763		

In England, there are also 161 Small Holdings Societies, most of which have

Raiffeisen and Schulze-Delitzsch were the men whose economic genius gave rise to credit banking. The former started his first bank in 1849, and Schulze-Delitzsch in the following year. In both cases the exorbitant usury charged by the money-lenders caused these benefactors to take action. Their methods varied, but the results achieved by each were eminently satisfactory. To-day, the credit banks of Germany number over 15,000. Those of the Schulze-Delitzsch type were intended more for urban artisans and industrial workers. On the other hand, the Raiffeisen bank is better adapted for dealing with agricultural credit.

The outstanding features of the Raiffeisen system are as follow:—

1. They are registered co-operative societies with unlimited liability.

2. The society and its administration are entirely local and confined to a small district, often even a single village.

3. The management is intrusted to an elected committee of four or five members. A council of supervision of three controls the acts of the committee, seeing, for instance, that the loans are granted regularly.

4. The services of the members of both committee and council are gratuitous; only the accountant or cashier is paid.

5. Loans are granted only to members.

6. The capital represented by the members' shares is small, the bulk consisting of savings deposited with the society. In some districts, as mentioned later, central banks have been established and these supply funds to the branch banks. Advances of Government money are also made.

7. Loans are only granted for some reproductive or economic purpose approved of by the members.

8. Every member of the society is equally with every other member jointly and severally liable for all debts incurred by the society and for any loan which a member may fail to pay.

This last provision is not necessary, and has not been adopted in the Victorian institution mentioned.

"Capitalization of honesty" has been the keynote which has brought success to co-operative banking. By virtue of the circumscribed area in which each society operates, the management is able to correctly gauge the character of the applicant and the purpose for which the loan is to be applied. The result has been that the losses have been practically nil. There is also a moral side to the question. In many districts where the banks were opened the people were ignorant and unreliable, but the establishment of the local bank in which they were all interested has raised them to a higher standard of life. They were put on their honour and responded. Thrift has been encouraged with beneficent results. A current saying is, "Whoever sets up Raiffeisen banks pulls down work-houses." Prompt payment of interest is insisted upon. When dealing with this matter, H. W. Wolff, the leading authority on Agricultural Banks, writes—

> The bank will forgive anything rather than unpunctuality or remissness in this respect. And the effect which such strictness has in training men to business habits is remarkable. Should the borrower fail to apply the money as was stipulated, without hesitation or mercy the loan is called in, within four weeks' time, the sureties being made responsible.

Central Banks.

In some countries, for instance, in England, France, and Germany, the necessary funds required by credit banks are supplied by Central Banks.

The Central Co-operative Agricultural Bank Limited (England) was founded in 1908 under the auspices of the Agricultural Organization Society, which is rendering such good service to the co-operative movement in the Old Country. The objects of the bank are to make advances at

moderate rates of interest to properly organized co-operative credit societies, dividends being limited to 5 per cent.

Agricultural credit is making headway in France, where the central or district banks now number 95. In 1895, a law was passed authorizing the Government to make advances, free of interest, to these banks. The following figures show the result of this provision:—

	1900.	1909.
State loans	£24,500	£1,850,000
District banks	9	95
Local banks	87	2,083
Members	2,175	133,382
Loans	£76,000	£4,201,000

Members of a local bank must also be members of an agricultural association, but the number need not exceed seven. The duration of loans varies according to the nature of the object for which the money is to be applied; for instance, if for artificial manures or for seed, the term admits of the crop being harvested and sold.

The French Ministry of Agriculture has established a bureau for the special purpose of assisting the movement by the distribution of information. The bureau issues model rules, handbooks, &c., and acts generally in an advisory and administrative capacity. The accounts of the banks are also inspected by the officers of the bureau.

There are 37 central banks in Germany. The Central Bank of Neuwied, which was founded by Raiffeisen in 1876, has no less than 4,340 affiliated societies; Munich has 2,080 societies; others, like Erfurt, have as few as 11. The total business (outgoings and incomings) of the Neuwied Bank for 1908 amounted to over £37,000,000.

A VICTORIAN CREDIT BANK.

Reference has been made previously in this article to the Co-operative Credit Bank of Victoria Limited. Although this institution is not, like its Old World prototypes, local in its sphere of action, its shareholders are united by a common bond, inasmuch as they are past or present officers of the Imperial, Commonwealth, or State service.

The establishment of a credit bank was first mentioned at a meeting of the advisory members of the Civil Service Co-operative Society of Victoria, and, as a result, a committee was appointed to consider the matter. The writer was one of the members of the committee; and, subsequently, he was elected to the first Board of Directors, and continued as such for two years, being Chairman during 1907-8.

After careful consideration, the Committee recommended the formation of a co-operative credit bank. The rules were registered on the 4th December, 1905, under the Provident Societies Act, and business was commenced at the end of February, 1906, with a capital of £117. To-day, the paid-up capital amounts to £2,343. The following figures, taken from the balance-sheets, indicate the growth of the institution.

In addition to writing off the preliminary expenses and providing for reasonable depreciation of furniture, a reserve fund of £120 has been created. A further reserve, to make provision for possible bad debts, has just been inaugurated, and £10 placed to its credit.

Loans have been granted for quite a variety of purposes, *e.g.*, liquidation of loans obtained at usurious rates; renovation of, and additions to, dwellings; purchase of horses, cows, and vehicles; deposits on land; payment of University fees to enable students to complete their course, &c.

CO-OPERATIVE CREDIT BANK OF VICTORIA, LIMITED.

Half-year ending—	Capital.	Loans.		Dividend.
—		No.	Amount.	
	£		£	%
August, 1906	425	95	616	—
February, 1907	935	132	1,116	6
August, 1907	1,674	198	1,919	6
February, 1908	2,010	190	1,848	6
August, 1908	2,269	199	2,214	5
February, 1909	2,356	174	1,665	4
August, 1909	2,398	188	2,203	4
February, 1910	2,449	191	1,598	4
August, 1910	2,511	121	2,202	5
February, 1911	2,369	86	1,629	4
August, 1911	2,343	170	1,811	4
		1,744	18,821	

Unless definitely stated to the contrary in the rules, share capital in societies registered under the Victorian Provident Societies Act is withdrawable on six months' notice being given to the management. So that ample time would be afforded for the Co-operative Credit Bank of Victoria to prove its success or otherwise, the original rules provided that capital should not be withdrawable until five years had elapsed. This period expired in October, 1910, and a slight decrease has resulted, owing to the fact that some of the shareholders have required their capital for other purposes.

In drafting the rules, the Raiffeisen system was not adopted in its entirety. For instance, it was necessary that the whole of the capital should be contributed by the shareholders whose liability was limited to the amount of the shares held by them. Although many took up shares simply to help the movement, they have had a fair financial return on their investment. In addition, they have had the satisfaction of knowing that they have been enabled to help others less fortunately circumstanced. As a director, I had ample opportunity of judging of the good work that is being done among the shareholders, many of whom in time of financial stress had previously to borrow elsewhere at exorbitant rates.

The management is vested in a board of directors (9) elected by the shareholders. After each annual election, the directors elect two of their number as chairman and secretary respectively. With the exception of the secretary, the services of the directors are gratuitous. Expenses for rent and clerical assistance have, of course, to be met.

The following are the rules governing the granting of loans:—

RULE 38.—LOANS.

(*a*) Loans, when approved by the Board of Directors, shall be granted to shareholders on the terms agreed upon in writing.

(*b*) No shareholder who is in possession of money lent to him by the Society shall be accepted as security for another member requiring a loan, unless the Board of Directors are unanimous that it is safe to do so.

(*c*) Shareholders who desire to obtain a loan shall fill up a form stating the object for which the loan is required, the term for which it is asked, whether it is desired to repay the loan by instalments, the sureties (if any), who will sign with him any agreement or promissory note, or the other security which is offered. The application, if received by the Secretary not less than two days prior to the meeting of the Board of Directors, shall be considered at that meeting.

(*d*) If the Board of Directors are satisfied with the trustworthiness of the applicant, the sufficiency of the security offered, the profitableness by productiveness or saving which the use of the loan may effect, and if they have sufficient funds under their control, they may sanction the loan.

(*e*) No loan shall be granted to a shareholder without surety or security which shall make the total sum owing by him to the Society at any time to exceed £5.

(*f*) If the Board of Directors decide that the loan cannot be made either from lack of funds, or if they otherwise deem it undesirable, or if they think proper to postpone the consideration of any application for a loan, notice to that effect shall be sent to the applicant by the Secretary.

(*g*) A loan granted may be made repayable in instalments at intervals of one week, two weeks, four weeks, six weeks, eight weeks, or three calendar months. If a borrower wishes to repay the loan by instalments, but to postpone the commencement of same for a longer period than here named, the loan can be made for a fixed term up to the time when it is desired that the instalments shall commence.

(*h*) The interest shall be payable on the same dates as the instalments are repayable.

(*i*) If the Board of Directors find it necessary for the borrower to make any payment on account of the expenses of management, or expenses incurred in connexion with the loan obtained, then such payment shall be made by the borrower at the time that the loan is advanced, or when the expenditure is incurred.

(*j*) When a loan is sanctioned a notice shall be sent to the borrower to that effect, and if the borrower does not consent to take the loan on the terms offered by the Board of Directors within one week from the date upon which the Board's assent is given, the Board of Directors shall not be held bound to complete the loan. If he consents to accept the terms offered, then, before the amount is advanced, the borrower, and his sureties, if required, shall execute a bill of exchange, promissory note, declaration as to possession of effects free from encumbrance, an agreement as to the terms of repayment, or any other document which the Board of Directors may consider necessary.

(*k*) In the case of loans being sanctioned on security of real property a policy of insurance shall, if the Board of Directors deem it necessary, be taken out on such property.

(*l*) If the loan be repayable by instalments, the borrower shall be supplied with a card, upon which shall be stated the amount and terms of advance, and upon which the instalments and interest, when repaid by him, shall be entered and initialled by the official to whom the money is paid.

(*m*) No person other than a member of the Board of Directors shall be present at any meeting of the Board when an application for a loan is under consideration. If there is a difference of opinion concerning the granting of a loan, the voting shall be taken by ballot. The proceedings with regard to loans at Board meetings shall be kept secret and any member of the Board of Directors or officer of Society infringing this rule shall be liable to immediate suspension.

(*n*) In the event of any loan, or instalment of loan, not being paid on the date when it is due, the Secretary shall send a notice to the defaulting borrower. If the amount due is not paid within two weeks, together with the additional interest and a fine of 3d. in the £1 of the loan or instalment of loan owing, and no satisfactory explanation is placed before the Board of Directors for non-payment, then the borrower and his sureties shall be required to pay within fourteen days the whole amount then owing, or, if other security has been given, steps shall be taken towards the realization of the same.

(*o*) A shareholder failing to pay the amount due and the fine within the time named, and not giving, in the opinion of the Board of Directors, a sufficient reason for non-payment, shall not receive another loan from the Society.

(*p*) If, by reason of sickness or other sufficient cause, notified to the Secretary before loan is due, a shareholder finds he will be unable to discharge his obligations to the Society, the Board of Directors shall have power to remit the fine. They shall also have power to extend the time fixed for payment on such conditions as they think fit.

(*q*) If any shareholder shall be found to have misapplied a loan, the Board of Directors shall have power to recall the loan or otherwise punish the offender according to the rules.

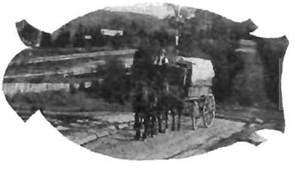
Each applicant for a loan is required to furnish the following particulars for the information of the Board of Directors:—

1. Full name of applicant—
2. Official address—
3. (*a*) In what capacity employed—
   (*b*) Whether employed permanently or temporarily—
   (*c*) Amount of salary, wages, or fees—
   (*d*) Married or single—
4. (*a*) Date from which loan is required—
   (*b*) Period for which loan is required—
   (*c*) Purpose for which loan is required—
5. Is the applicant under any liability—(*a*) as a borrower, or (*b*) as a surety for any borrower?—
6. Has the applicant (*a*) been insolvent, or (*b*) made any arrangement with his creditors?—
7. Has the applicant given a bill of sale over any portion of his property?—
8. Is there any judgment pending against the applicant?—
9. What security is offered?—
10. What sureties are offered?—
11. Names of sureties in full—
    Address (private and business)—
    Trade or profession—
    How long known to borrower—
    Are proposed sureties creditors of or in any way responsible for borrower in any other transaction?—

ADAPTATION TO AUSTRALASIAN CONDITIONS.

The success of credit banking in European countries and elsewhere is such as to recommend its adoption in these southern lands. Victoria has, in the instance just quoted, shown the way. It seems, however, that its general application to the needs of the farming community will be first given effect to in New Zealand. Sir Joseph Ward, Prime Minister of the Dominion, has recently announced the intention of his Government to establish farmers' co-operative banks to enable men of small means, or associations of men, to whom credit is not readily accessible under the existing banking system, to obtain it for productive purposes or purposes insuring economy. The banks will be incorporated and empowered to borrow money for the purposes of loans to their members.

Provided that the safeguards of selection, discrimination, and control are strictly applied, it is evident that credit banking may be safely entered upon. The Co-operative Credit Bank of Victoria has, in 5½ years, granted 1,744 loans totalling nearly £19,000, and has sustained but one loss. This is truly an excellent record, and it has been accomplished by a bank the shareholders of which number 1,180, and who are scattered throughout the State, and with whom the directors have no means of getting into personal touch. That being so, purely local institutions, managed by local residents whose interests and those of the borrowers are identical, should be similarly successful. If, by means of credit banking, our settlers can increase the area under cultivation and the number of their stock, both the State and the individual will be the richer.

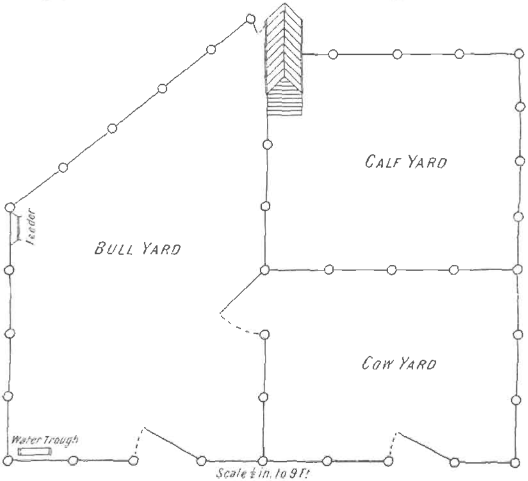


BUILDING HINTS FOR SETTLERS.

XV.—BULL YARD AND SHED.

T. A. J. Smith, Chief Field Officer.

Every dairyman and breeder of cattle should have a bull yard and shed. The cost is small and the trouble of feeding and attention slight, while the advantages of the system are many. The dates on which cows are served can be ascertained with greater accuracy, and the bull's services not taxed to an undue extent. A bull so kept is able to serve quite 15 per cent. more cows, with less loss of energy, than if allowed



PLAN OF BULL YARD, WHITFIELD.

to run with the herd. There is practically no risk of injury through fighting with other animals, getting into drains, fences, and the various other difficulties that a bull at large is liable to encounter. A wandering bull is, moreover, a constant source of trouble to his owner and the cause of many quarrels between neighbours. Consequently, the expense of the yard and trouble of looking after the bull are more than compensated for.

The site of the bull yard should always be on a rising piece of ground with good drainage on one or two sides, a fair slope being no disadvantage. The shape can be square, round, or octagonal, according to the builder's fancy, but that of the one illustrated has proved more useful than either a square or circular yard. The triangular corner is very convenient when driving a refractory animal into its box, or for catching a horse.

At the Government Farm, Whitfield, where the photographs were taken, the yard adjoins the cow yard with a gate connecting, so that an

SECTION OF FENCE, SHOWING GATE.

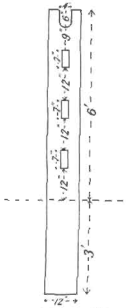
animal can be drafted in or out with the least possible trouble. The calf yard and shed are also convenient to the milking yards and herdsman's hut.

BULL SHED.

The bull shed is on the highest portion of the slope and is 12 ft. by 12 ft. (inside measurement), and is lined with 1-in. boards to a

height of 6 ft., the space above being latticed to allow plenty of ventilation. The floor of the shed is trampled clay, and is 6 in. higher than the surrounding ground level. The roof is iron with a bark lining to reduce the heat in summer, whilst the doors are in two sections, one above the other, of 1-in. wood, strongly braced, and hung on heavy hinges with bolts for fastenings. The bolts are supplemented with a cross-bar and padlock.

The calf shed is a continuation of the bull shed with the door opening into the opposite yard, the two buildings making a portion of the yard. The dimensions are:—4 panels wide, 7 deep on the longest side (including the building), 4 deep on the short side, with 5 panels forming the wing, each panel being 9 ft. There is a gate into the paddock, in addition to that into the cow yard and a small gate adjoining the bull shed to give the herdsman easy access. The feeder and water trough are placed in different corners so that the bull will not keep in the same spot for a lengthy period. Shade trees on the northern side would be of advantage.



Scale ¼ in. to 1 Ft

POST.

The timber used in the building under review consists of stringybark, but redgum or box is even better. The rails are all 9 ft. long, by 10 to 12 in. wide, and 4 to 6 in. thick. The posts are 9 ft. in length and 12 in. x 5 in. on the top. Each post is mortised for three rails and a cap, and is placed 3 ft. in the ground, the first mortise being 12 in. from the ground level. Three of the mortise holes are 7 in. x 4 in.; whilst the fourth one (on the top of the post) is 6 in. x 4 in. There is a space of 1 ft. between the rails, and of 9 in. between the top rail and the cap.

Eight round posts will be required for corner and gate posts. These should be not less than 15 in. in diameter and mortised at similar distances to the other posts. Nine split posts, 48 rails, and sapling caps will be wanted. The caps, bound on with wire, should also cover the gates.

The cost of the timber should be—posts, 25s.; rails, 50s.; caps, 20s.; gates, (3), 40s.; labour, 90s. Total, £11 5s. A satisfactory bull shed may be erected for £10, whilst the cost of troughs, &c., would be £1 10s., making a grand total for the yard and shed of £22 15s.

It will pay a novice to get a good fencer to put up such a yard for him, as mortising posts requires experience to keep the holes square and true. For putting up the panels, the rails must be adzed truely, the mortises well filled, and the whole kept true to line, otherwise the rails will have a dip and the caps be uneven, spoiling the whole appearance. A well fitted, straightly built fence will not only look better, but will last longer than one poorly put up.

FRENCH PRUNES.

P. J. Carmody, Chief Orchard Supervisor; and F. de Castella, Government Viticulturist.

The following particulars concerning the methods followed in the preparation of French "Agen" prunes, the finest in the world, should prove of interest. Though these are often known to the trade as Bordeaux prunes, the case is similar to that of Port wine and Barcelona nuts; the district where the prunes are grown and dried being situated much further inland and quite distinct from the port of shipment, the name of which has become identified with them in English-speaking countries.

The industry is an example of that localization which is so marked a feature of French agriculture and horticulture, for it is restricted to the neighbourhood of Agen, the capital of the department of Lot-et-Garonne, a town of some 25,000 inhabitants. The district proved itself eminently suited for prune production and to the cultivation of this tree growers have very generally turned their attention, with the result that it is now the leading industry; the average value of the prune crop having reached 20 to 30 million francs, or about a million sterling, annually.

The factors which contribute to the excellence of the product are the suitability of the locality (soil and climate), the variety grown, and the method of drying.

Agen is cool, too cool, in fact, for it to be practicable to dry fruit in the sun. It is near the Northern limit of the Olive zone and therefore the climate is more similar to the coast side of the Dividing Range than to Northern Victoria. This suggests possibilities for this industry in the cooler parts of the State, where the apple is the leading fruit. The thin skin resulting from the cool moist climate seems to have much to do with the high quality of the finished article.

The variety grown is exclusively the *Prune d'Ente*, a sweet and thin-skinned black plum, with a very small pit, which may or may not be identical with the plum known as *Prune d'Agen* in our orchards. Unfortunately, some young trees of the true prune d'Ente, brought back from France by Mr. de Castella in 1908, did not, owing to want of cool storage, survive the voyage, else the question would be in a fair way towards being decided.

It is, however, with drying methods that the present article proposes to deal. For the information concerning this part of the subject we are indebted to an interesting series of articles by Professor E. Rabaté,* describing in detail a working trial of prune ovens, or *étuves*, as they are called in French, held, in September, 1910, at Villeneuve-sur-Lot, near Agen, under the auspices of, and financially assisted by, the French Minister of Agriculture, the department of Lot-et-Garonne, the town of Villeneuve-sur-Lot, and the agricultural &c. societies of the region, including the Villeneuve Syndicat of prune merchants. Ten different makers competed.

Similar trials had previously been held at Villeneuve in 1860-'61 and 1879, at Bergerac in 1872, and at Agen in 1896.

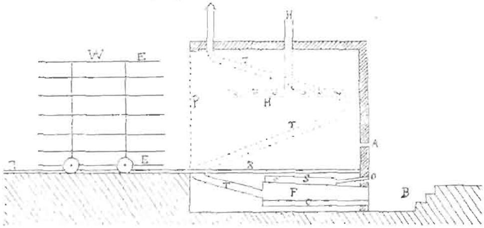
The artificially heated drier or evaporator appears to be absolutely essential to the production of high class prunes, which are half cooked,

* *Progrès Agricole*, 23rd April, 7th May, and 4th June, 1911. Etudes pratiques sur le sechage des fruits: E. Rabaté, Professeur Départementale d'Agriculture de Lot-et-Garonne.

or stewed in their own steam, rather than dried in the way we understand the process with our sun-dried raisins, apricots, &c. To this system of drying, they no doubt owe their peculiar qualities and in order to turn out anything at all similar we will, no doubt, find it to our advantage to adopt the methods which are the result of long years of practice in France.

The Agen prune industry is a very old established one. For fully 50 years drying ovens or evaporators have been in general use*; they are usually of small size and worked by the grower himself, this being more to his taste and financial advantage than the sale of his fruit to a drying factory. Though a few large industrial establishments exist, home-drying is almost the invariable rule.

The prune grower thus employs his workmen at a time when other work is not urgent; he uses up pruning wood of little value. The prune d'Ente when very ripe, that is to say, when very rich in sugar and capable of giving a high yield in dry prunes, is difficult to carry owing to the thinness of its skin; finally, the grower is naturally desirous to keep for himself the profit on drying.



DIAGRAMMATIC SECTION OF PRUNE OVEN. (AFTER RABATÉ.)

B, recess for fireman; A, cold air entrance; O, entrance for air to be heated; S, heating chamber; F, fire-box; C, ash-pan; T,T,T, smoke flues; H,H, pipes for removal of moist air; P, door; R,R, rails; W, truck; E,E, shelves to carrying drying trays.—Scale; about 6 ft. to 1 in.

The ovens most favoured are of rather small size. The dimensions of the most successful models at the 1910 trial were as follows:—length, 8 to 9 feet; width, 4 ft. 11 in. to 5 ft. 3 in.; with a height of about 6 feet above the fire-box. Large orchardists prefer to have several ovens of medium size, rather than one larger one. The highest price which prune-growers are prepared to pay for the machines, exclusive of brick-work, is from £14 to £16. Both as regards dimensions and general plan there is a good deal of uniformity, the differences between the competing machines mainly concerning details of construction. In a general way, they all consisted of three main parts—a fire-box, a drying chamber situated immediately over it, and a truck running on rails on which the trays containing the fruit are stacked: this movable truck permits the rapid withdrawal of the fruit when it needs cooling, as it usually does twice during the drying process.

* The special drying oven has been evolved gradually, and is, no doubt, the outcome of the old time method of drying prunes in the ordinary baker's oven after a batch o' bread has been baked. This is the course recommended in old books on the subject.

The diagram will give some idea of the arrangement of these different parts. It is only intended to show the main principles; details vary very considerably with different makes of machines. The drying chamber is usually built of masonry or brick; the latter permits the use of hollow walls which minimize loss of heat. The fire-box is either of wrought, or preferably of, cast iron. The rails on which the truck runs are immediately over the fire-box. Provision for the entry of fresh air (hot or cold, according to the make of machine) and for the evacuation of moist air, seems of considerable importance, especially the latter. According to Professor Rabaté:—

> It is most important to be able, during the currency of the drying, to vary the degree of moisture in the interior of the oven. It is therefore necessary to place, at suitable points, openings, the aperture of which can be altered at will. This is the principal constructional point concerning which investigation is necessary. In the present ovens the exit of moist air is always under control. The exits are narrow, and at given moments they are completely closed. The prune then cooks itsself* in an atmosphere saturated with steam. Many practical driers consider that this preparation in a moist and hot atmosphere contributes to give to Agen prunes their colour, their gloss, and their so delicate aioma.

Evenness of heating, so that drying is equally rapid throughout the machine, is another necessary feature. It is not possible to here reproduce all that is said concerning the structure and working of the different machines; an account of the drying process in the winner of the first prize will suffice. This was exhibited by M. Boudie, of Allez, par Sainte-Livrade; its truck was 8 storied, each taking 6 trays, or 48 in all.

The absence of any preliminary preparation before undergoing the drying process is noteworthy—Agen prunes are neither dipped in lye nor is the skin pricked mechanically, as is usually the case with Californian prunes. The thinness of skin already referred to, and the high temperature at which drying is conducted, no doubt render this not only unnecessary but undesirable.

Work was controlled with the aid of a thermometer, placed in a recess in the door, 4 ft. 3 in. above the rails. A pane of glass separated the thermometer from the outside air.

Two principles were constantly observed:—

1st. The temperature should never descend after the moment when, the prunes having been placed in the oven, equilibrium is established. The temperature should rise, or else remain stationary, if it be up to the required degree.

2nd. Moisture should never condense on the thermometer pane; if a deposit commences to form, the air entrance must be opened so as to carry away the surplus steam.

The work comprises three phases: Wrinkling, Seconding, and Finishing.

Wrinkling.—The empty oven is first heated for about an hour, with all air entrances closed, so as to reach 212° F. The truck, loaded with fruit, is then wheeled into it. The thermometer descends progressively to 140° at the close of an hour. Air entrances are gradually opened to carry off surplus moisture.

Two hours after the introduction of the fruit, the door is slightly opened to see if the prunes have not swelled too much. If leakage of juice is feared, the truck is taken out for 5 minutes so that the skin may acquire strength. The truck is wheeled in once more and the thermometer falls again somewhat, reaching 129°-133° F. Under these conditions,

* The expression here used by M. Rabaté, "se confit," is difficult to translate. It really almost means "makes itself into jam."

the fruit may be left 6 hours without withdrawal and without inspection. The fire should be moderate enough to prevent the thermometer rising above 131° F. After 6 hours the truck is taken out for an hour.

Seconding.—While the fruit is exposed to the outside air, the fire is tended so as to raise the temperature to 176°-194°. The truck is once more wheeled in; juice will not run, if care is taken to fully open the two air entries, so as to evacuate the abundant steam which is given off. The fruit may once more be left in this state for another 6 hours at a temperature of 140° to 149° F. At the commencement of the sixth hour it is raised to 158°. During the six hours the door is opened once or twice to see if the prunes acquire a good brown colour and gloss. If there is no gloss the temperature is too low, the fire should be forced. At the close of the 6 hours the prunes commence to wrinkle; the truck is taken out again, and once more left for an hour in the open air.

Finishing.—As soon as the truck is removed, the air entrances are closed and the temperature is raised to 212° F. The truck is again introduced and the temperature falls to 140°; the air entrances remain closed during about an hour, until the thermometer pane shows slight moisture. The air entrances are then opened to carry off the excess of steam. For 6 hours heating is continued, so as to gradually reach 167° towards the fifth hour. The air entrances are constantly open during the last period of finishing, so that moisture may not soften the prune, which would cause delay and reduce quality. Towards the sixth hour the door is opened and the fruit is sometimes left for another hour in the oven so as to obtain complete drying.

The following additional particulars as to the first prize machine are interesting. Its price, exclusive of brick-work, was £13. During the trial it was twice charged with fresh fruit, the weight of the two charges totalling 1,119 lbs. This dried down to 437 lbs., or 35.7 per cent. of the weight of the fresh fruit; this was a low yield as, owing to the exceedingly wet season, the fruit was gorged with water and poor in dry matter. At the 1879 trial percentages varied from 36 to 46 per cent. of the weight of fresh fruit. The quantity of wood burnt was 1,054 lbs., or 241 lbs. per 100 lbs. of finished prunes, and 135 lbs. per 100 lbs. of water evaporated. The wet season was again at fault here, the wood being wet and of poor heating power; at the 1879 trial, the best machine only required 100 lbs. of wood to evaporate 100 lbs. water. The two charges took 49 hours 37 minutes to dry, or, if working continuously, at the rate of 211½ lbs. of finished prunes in 24 hours.

As proper cooking is much more important than the other technical points in connexion with drying, it was necessary to intrust a special jury, composed of growers and merchants, with the examination of the products prepared at the trial. Their award was based on the following points:—

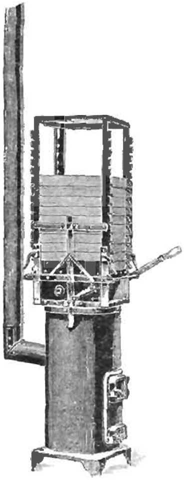
1. Colour and gloss of the skin.
2. General evenness of cooking of each batch of fruit.
3. Resistance and dryness of skin to the touch.
4. Degree of cooking of pulp and kernel.
5. Number of fruit to the pound.
6. Flavour of the fruit.

A further examination of the dried fruit was made some two months later, in order to test the keeping powers of samples dried by different machines. The results did not altogether tally with those of the first sampling. The first three machines were again at the top of the list though not in the same order.

The yield in marketable prunes was considered to be the main point in connexion with the working of the ovens. If one avoids over-heating, which causes the juice of the fruit to run, and if sufficient desiccation is obtained to assure good keeping power, the most difficult part of the drying problem has been solved; many prune growers consider expenditure of labour and fuel to be points of secondary importance.

A distinction is made between ovens or *étuves*, such as the type shown in the diagram, and evaporators; in the latter, the fruit is exposed to air which becomes gradually hotter and drier. In some models a series of trucks are moved forward in a long drying chamber, in reverse sense to the movement of the hot air, so that the almost finished fruit comes in contact with the hottest and driest air. Evaporators appear to be less popular, in the Agen district, than ovens of the older style.

An illustration is reproduced of a small evaporator of rather different type, manufactured by the well known firm of Vermorel; though too slow for dealing with large quantities, and requiring much supervision and fuel, the prunes turned out with it were of very excellent quality and great keeping power. This machine would no doubt prove useful for the drying of fruit on a small scale.



"VERMOREL" EVAPORATOR.

METHOD HITHERTO FOLLOWED IN VICTORIA.

The method of drying hitherto followed in Victoria differs considerably from the above, as will be seen from the following extract from *Guide to Growers*, No. 8, issued by the Department of Agriculture some years ago and now out of print:—

"Dip in lye to thin and crack the skin, which facilitates the escape of moisture in the drying process. In a large cauldron, lye is made with 1 lb. of concentrated lye to each 20 gallons of water, and kept boiling hot; or 1 lb. of washing soda to two buckets of water. Put the fruit into wire baskets, and then dip into the boiling lye for about a minute, or until the skin has a wrinkled appearance; then plunge the basket into clean cold water to rinse off the lye. The rinsing water must be frequently changed, for it soon becomes very alkaline. After this dipping, the prunes are placed on trays ready for the machine-drier or the sunshine. In the sun, the prune dries sufficiently in from one to two weeks, according to the situation and weather. When sufficiently dried, the prunes are put in boxes to sweat for about two weeks, and then they are ready for packing.

"*Glossing Prunes.*—The prevailing practice is to rely upon hot water, to which pure glycerine is added at the rate of 1 lb. to 20 gallons of water."

OVERSEA MARKETS FOR FRUIT AND FRUIT PULP.

J. G. Turner, Chief Horticultural Officer.

Following close behind the active immigration policy of the Government and recent local enterprise in land selection, there has been a considerable increase in the acreage put under orchard cultivation. This will naturally result in a proportionate increase in production. Accordingly, action in the direction of ascertaining the possibilities of other markets is a necessity of the hour.

With a view to obtaining particulars as to the possibilities of oversea markets, the Agent-General for this State in London was addressed last June, with a request to furnish information as to whether tomatoes, passion fruit, plums, peaches, cherries and fruit-pulp would be likely to meet with a favourable reception on the markets of the United Kingdom during certain periods. Information was also asked as to the most favoured methods of packing the most suitable kinds and capacities of packages, sizes and varieties of fruit most likely to meet with good markets, market expenses per package, probable prices that would be realized, and any other information which might prove of use to Victorian shippers. Particulars as regards the possibilities of the Continental and other markets were also sought.

In reply to the above request, Sir John Taverner, the Agent-General for Victoria, has made inquiries and has furnished the following information:—

UNITED KINGDOM.

Office of the Agent-General, Victoria,
Melbourne Place, Strand,
London, W.C.,
16th August, 1911.

SIR,

I have the honour to acknowledge the receipt of the Director of Agriculture's despatch of the 29th June last, and to inform you of the result of the inquiries I have made in the matter.

Peaches.—I am advised that there would be a good demand for this fruit at the time of the year mentioned by you, viz., January to March, and that the same would meet with a most favourable market on the United Kingdom markets, the only competition being from South Africa. No clingstones should be sent, and the peaches should be packed in trays containing twenty-four peaches, each being wrapped in tissue paper packed with aspen wood-wool and done up in packages of three trays each. If packed in this manner and found to be in good condition on arrival, it is thought that they would realize from 10s. to 15s. per tray. A sample of aspen wood-wool used in the packing of South African fruit is sent herewith.

Plums.—There would be a good demand for this class of fruit at the period quoted by you (from January to April), the only competition being from South Africa. The best variety to be sent is the Kelsey, this being known on the market here. They should be placed in trays containing thirty-six plums and packed in the manner suggested for peaches. The approximate price which they would realize is, I understand, about 6s. per tray. The commoner kinds, such as Pond's Seedling, Green Gage, Diamond, &c., might be sent in half cases.

Cherries.—It is doubtful if a market for this fruit could be established here in view of the period mentioned (December and January), and only small quantities should be sent. The finest should be packed in 2 lb. boxes, 10 boxes being crated together; others may be packed in half cases. Owing to the fact that cherries have never arrived on this market at the time of year mentioned I regret having been unable to ascertain what price they would bring.

In this connexion I think that a very good outlet for our fruit could be found in the United States of America, and I am attaching hereto a copy of a letter received from the I. Rheinstrom & Sons Co., Fruit Preservers, of Cincinatti,

U.S.A., which I forwarded to the Minister of Agriculture under cover of a despatch dated 21st October, 1910. At the time this company made their inquiry I was notified by you that there was no prospect of a trade in cherries, but it would appear that a favourable opportunity is now presented for the re-opening of the matter.

Passion Fruit.—The demand for this is limited and exports should be treated quite as an experiment. The fruit should be packed in trays and the packing herein suggested for peaches should be used. The price which it is thought would be realized would be about 1s. 2d. to 2s. 6d. per dozen.

Tomatoes.—It is the opinion of the firms I have consulted *re* this matter that it would not pay to send tomatoes from Victoria to the United Kingdom to arrive February to May, since they are being received from the Canary Islands at that time of the year.

Fruit Pulp.—I am dealing with this matter by a separate despatch either by this or next mail.

Charges.—With regard to your inquiry as to the marketing expenses per package, there would be 5 per cent. brokerage commission and about 9d. per bushel case for carriage from the docks, &c.

I am going fully into the question of the prospect of trade with other markets in connexion with the fruits, &c., named and will forward you full particulars as the same are received.

(Signed,) W. TAVERNER,
Agent-General for Victoria.

AMERICAN MARKET FOR CHERRIES.

(From the I. Rheinstrom & Sons Co. Ltd., Fruit Preservers, Cincinatti, U.S.A., to the Agent-General for Victoria.)

SIR,

We beg to thank you sincerely for your cablegram of the 3rd inst., advising us that the Victorian Government states there is no prospect of a supply of cherries from Victoria.

We deeply regret this, as the supply of cherries for Maraschino and canning purposes is being very limited over the world. We might mention for the information of your Government that the Italian supply is between two and three million pounds of cherries available for this purpose and there is practically no other source that is dependable for any. On the other hand, the requirements are fast approaching ten million pounds per year and will reach that in the course of two or three years.

As Victoria is probably the best adapted fruit-growing State for this class of fruit, the information may be interesting to its Agricultural Department.

Again thanking you sincerely and assuring you of our appreciation of your care in this matter, we rest,

Your obedient servants,

THE I. RHEINSTROM & SONS, Inc.
Per (Sgd.) WALTER L. RODMAN.

FRUIT PULP.

London, 18th August, 1911.

SIR,

In continuation of my letter of this mail, I have the honour to inform you that I have caused inquiries to be made as to the prospects of Fruit Pulp meeting with a favourable market in the United Kingdom markets, and beg to report as follows :—

At the present there is a good market owing to the present shortage of fruit. Apricots are now worth 26s. to 30s. per cwt., Black Currants 35s. to 50s., Raspberries 35s. to 40s., but before exporting fruit pulp at any time of the year, the exact state of the market here should be first ascertained as the prices fluctuate greatly owing to the greatly varying quantities.

The best way to pack pulp is in cases containing 10 tins; each tin weighing 5 kilos, the contents of each case thus equalling 1 cwt., and it should be specially noted that pulp packed in this manner (5 kilos tin system), with which London merchants are familiar, will always command a better market.

Raspberry pulp, as above-mentioned, is now worth from 35s. to 40s. per cwt., and I am advised that it is likely to keep at this figure for several months, so our producers may think well of sending their next season's pulp to this market.

Before doing so it would, perhaps, be advisable for you to cable me to ascertain the prospects in order to prevent dissatisfaction as far as possible.

I cabled to you yesterday in the following terms as a result of information received from Messrs. Becker, Dietz & Co., of 31 Eastcheap, E.C., to the effect that they were willing to buy 100 tons of raspberry pulp at the price mentioned, subject to its being of the same quality as that exported by Taylor Bros., of Tasmania:—

"Raspberry pulp selling 35s. to 40s. per cwt. Buyers 100 tons these prices quality equal Taylor Bros., Tasmania."

I am instituting inquiries as to the prospects on other markets and will apprise you in due course.

The London market practically rules the prices and those above given may be accepted as approximate prices obtaining at other centres throughout the United Kingdom

(Sgd.) J. W. TAVERNER,
Agent-General for Victoria.

HAMBURG.

London, 25th August, 1911.

SIR,

With further reference to the despatch from your Department of the 29th June last, I beg to inform you that, having made inquiries in regard to the prospects of trade with the Hamburg market, I have received the undermentioned reports:—

Cherries.—In only small quantities cherries may be shipped to this market to arrive here in December and January, at which time we think they would sell at satisfactory prices. The cherries must be packed in small boxes containing about 1 lb., and 10 of such boxes must be bundled together in one package.

Peaches and Plums have been imported into Germany for some years from South Africa during the months January to April and have been sold here at satisfaction. These articles were packed in one layer to the box and 10 such small boxes bundled together. We think if your Government could obtain trial shipments it would be better first to try the English markets and if results there are good to ship some small lots to this market.

Passion Fruit does not suit the German taste and therefore it is useless to ship to this market.

Tomatoes are coming to our market in sufficient quantities from the Canary Islands and we do not recommend shipments from Australia.

Fruit Pulp is paying a very high duty (M.60 per 100 kilos) and therefore no business can be done here.

(Sgd.) J. W. TAVERNER,
Agent-General for Victoria.

GERMANY.

London, 1st September, 1911.

SIR,

Following up my despatch of the 25th ult., I have now the honour to give you a copy of a report which I have received from Messrs. Lohmann in connexion with my inquiries as to the prospects of trade in Australian Fruit on the German markets:—

Fruit Pulp.—This cannot be imported into Germany, as there is a duty of 60 marks per 100 kilos, so that practically only special marks of old-established English fruit jams and marmalades can still be imported.

Passion Fruit is very little known with us. The fruit is cheap in Australia and if growers are willing to sacrifice in the beginning of the trade some money to introduce the fruit, I feel confident that in three or four years' time this fruit should find its market, but at present it will be impossible to advise any shipments without this word of warning.

Tomatoes, Plums, Peaches and Cherries.—Especially in the months of arrival given in your letter under review, there would be a splendid market and extreme prices can be expected. Without knowing the quality, of course, it will not be possible to give you an idea as to prices. You may be aware that Cape Colony for three or four years has been regularly supplying the Bremen and Hamburg

NOTE.—One Mark is equal to about 11¾d. (20·40 marks = £1); one Kilo is equal to about 2¼ lbs. (45·35 Kilos = 100 lbs.)—J.G.T.

markets with plums, peaches, grapes and pears, in the months of January to April.

Therefore, I would hesitate to give you an idea as to prices, but if the quality is good, *you can be sure of excellent prices.* Even in the months of April and May we have realized in Bremen for first-class pears 26 to 28 marks per case, and if they could arrive during the season of January to March, when all the dinner parties of the winter season are still on and when the shops demand 3s. and 4s. per pound for French grapes, you will see that it is not a matter of price but of quality which has to be considered.

Packing.—Generally speaking, I will advise not to take too large cases and to pack the fruit in "Holzwools" (wood shavings) or cork shavings. Peaches and plums would be best packed in tissue paper, each fruit separately.

The market expenses in Bremen and Hamburg would be 5 per cent. commission and 6d. per case of about 20 kilos; if the cases were smaller, the price per case would be reduced in proportion.

Messrs. Lohmann & Co. have been selling in the Hamburg and Bremen markets, as well as in Berlin and towns in the interior of Germany, for the last twelve years, and have agents in the principal towns of Southern Germany for certain classes of fruit. Should any of our producers desire to forward consignments for disposal on the German markets, I would strongly recommend their sending to this firm.

(Sgd.) J. W. TAVERNER,
Agent-General for Victoria.

DENMARK.

London, 13th September, 1911.

SIR,

Following up my previous report I now have the honour to inform you of the result of my inquiries with regard to Denmark. Copenhagen imports fresh fruits other than apples from France, and North and South Africa.

Fruit to arrive in this market should be packed in boxes 22 in. long and 16 in. broad, in one layer, packed in very fine wood-wool or paper slips. Apples to be packed as at present. The times of arrival as set out in your despatch are suitable, as there are no Danish fruits at the times mentioned. Passion fruit is unknown in Denmark. California is doing a fair business in connexion with fruit pulp and canned peaches, apricots, pears, apples and plums. The import duty on preserved fruit is 13s. 6½d. per cwt.

Messrs. Rathe & Holm, 12, Frederikshave, Copenhagen, are recommended to me as reliable agents who would be glad to receive consignments and do their best to open up the trade. I would recommend that this firm be intrusted with small consignments with a view to testing the Copenhagen market.

(Sgd.) J. W. TAVERNER,
Agent-General for Victoria.

GERMANY.

London, 29th September, 1911.

SIR,

Following up my previous despatches with reference to your inquiry of the 29th June last, I have to report that Messrs. Lohmann, of Bremen, inform me that they have made further inquiries with regard to fresh fruit outside apples from Australia, and now give me the following particulars regarding prices. Herewith I give last year's current prices for Cape fruits :—

Peaches, packed in small cases containing 12, 15, 18, 20, 24, 26 and 30 each, according to quality, size and condition, realized M3½, M6¾, M9, M12½ the case.

Plums were packed 20, 24, 28, 30 and 36 to a case and realized, according to quality and condition, M3½, M5½, M7, M8¼ per case.

Apricots were packed 24, 30 and 36 each case, realizing M5, M6¼ per case.

Pears were packed, according to size, in cases containing 16, 20, 40, 44, 45 and 48, realizing, according to quality and condition, per case M2¼, M4½, M7 and M8¾.

Melons were packed in cases of 3, 4, 5, 6 and 7, realizing, according to size and quality, M1½, M3, M6¾ per case.

Grapes.—5 kilos (about 11 lbs.) to a case, realized according to quality, size of the grapes and entire fruit and condition, per case, M3¾, M5¾, M6¾.

Dried Fruit (apples and apricots).—So far, the Californian fruit, which is well known in the German market, is cheaper than the Australian.

Australian dried apples were offered at Bremen, c.i.f., at 65 marks per 50 kilos, apricots at 65s. to 68s. per cwt. Dried fruits coming from California are usually packed in cases of 12½ kilos net. Australian raisins would have to compete against sultanas: the latter realizing now 40-00 marks.

Fruit pulp so far has only been offered in the shape of apricots in this market, but it is understood that contracts have been made for delivery at the price of 26-28 marks, but the pulp so far imported has not been up to the samples submitted, and the Chamber of Commerce had to arrange for arbitration and the pulp in several instances was sold later on to 23-24 marks. Quite recently there was more demand and spot fruit pulp was asked for at the price of 30 marks per 50 kilos. The main necessity is that the fruit pulp should be divided in halves and they should arrive sound and that the juice be thick and tasty. The fruit pulp received so far has been packed hermetically in tins of 5 kilos. Messrs. Lohmann add that in various cases whole or part consignments arrived in an utterly useless condition and were condemned by the authorities. The fruits were mostly packed in wood shavings and each fruit wrapped in tissue paper.

(Sgd.) J. W. TAVERNER,
Agent-General for Victoria.

BENEFICIAL INSECTS.

PARASITIC WASPS.

C. French, Junr., Acting Government Entomologist.

By the majority of people the opinion is held that all insects are necessarily useless. This, however, is not the case. Many insects, especially those belonging to the *Hymenoptera* order, which includes bees, wasps, ichneumons, &c., are decidedly beneficial and should not be destroyed. It is therefore proposed from time to time to give a short account of the various beneficial insects found in Victoria. As the Wasp family contains many examples it will be the first to receive attention.

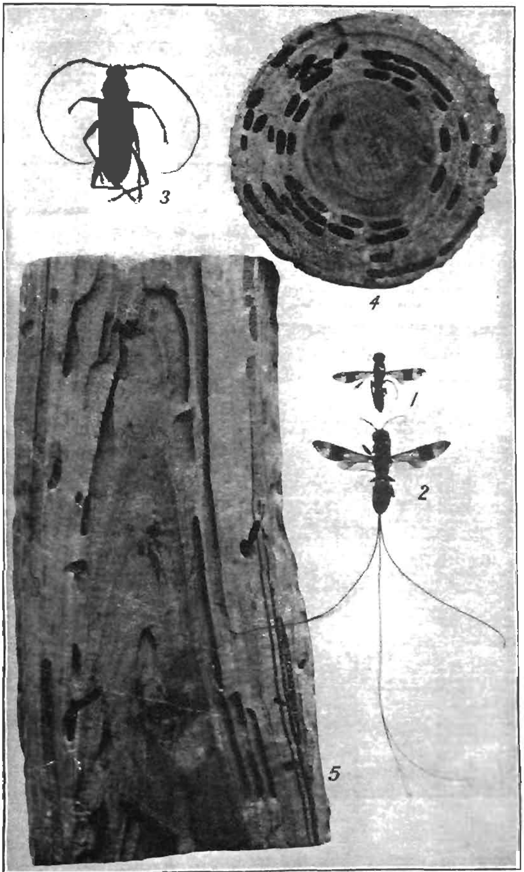
The particular wasp illustrated is *Magalyra fasciipennis*, and is commonly known as the Long-tailed Wasp. The male is usually much smaller than the female. The latter, however, varies considerably in size and also in colour. Figs. 1 and 2 are typical specimens. Its general colour is shining black with small whitish hairs on head, thorax, and abdomen, the latter being smooth. The forewings are dark brown with a dark brown colour across the wings and at the tips, but in some females they are sometimes almost black.

The remarkable ovipositor of the female insect often measures nearly 3 in. long. It is composed of three parts; the actual borer, which occupies the centre, and the two sheaths which act as a protection to the ovipositor when it is not in use. The borer is dark brown, but the sheaths are almost black, and have minute hairlets resembling serrated edges. The three separate pieces resemble horse hair.

The insect, by means of its ovipositor, can pierce living timber and deposit its eggs in the larvæ of the destructive timber and fruit-tree boring beetles, principally the Longicorns (Long-horned Beetles) and the Buprestids (Jewel Beetles). When the insect is dead the parts of the ovipositor usually separate and fall into a lyre-like form. It is in consequence of this propensity that Westwood, the well-known entomologist, gave the genus the name of *Megalyra* or Large Lyre.

EXPLANATION OF PLATE.

1. Male Wasp. (Natural size.)
2. Female Wasp. (Natural size.)
3. Longicorn Beetle. (Natural size.)
4 and 5. Timber bored by larvæ of Longicorn Beetle (Half original size.)



LONG-TAILED WASPS (1 AND 2) AND LONGICORN BEETLE (3).

Timber bored by Longicorn Beetle.

VICTORIAN EGG-LAYING COMPETITION, 1911-12,

CONDUCTED AT BURNLEY HORTICULTURAL SCHOOL.

(Continued from page 768.)

H. V. Hawkins, Poultry Expert.

No. of Pen.	Breed.	Name of Owner.	Eggs Laid during Competition. April to Sept.	Oct.	Total to Date (7 months).	Position in Competition.
12	White Leghorn ..	W. G. Swift ..	777	164	941	1
40	" ..	A. J. Cosh (S.A.) ..	755	150	905	2
31	" ..	R. W. Pope ..	733	168	901	3
33	" ..	Range Poultry Farm (Qld.)	674	152	826	4
20	" ..	H. McKenzie ..	656	163	819	5
37	" ..	E. Waldon ..	646	144	790	6
18	" ..	S. Brundrett ..	637	138	775	7
13	Black Orpington ..	D. Fisher	609	127	736	} 8
46	Minorca ..	G. W. Chalmers ..	603	133	736	}
21	White Leghorn ..	R. L. Appleford ..	564	154	718	10
25	" ..	B. Mitchell ..	564	138	702	11
44	Black Orpington ..	T. S. Goodisson ..	555	145	700	12
55	White Leghorn ..	W. G. McLister ..	552	146	698	13
32	Silver Wyandotte ..	M. A. Jones ..	572	124	696	14
39	White Leghorn ..	A. W. Hall ..	539	154	693	15
66	White Wyandotte	J. E. Bradley ..	542	120	662	} 16
38	White Leghorn ..	Mrs. C. R. Smee ..	513	149	662	}
9	" ..	J. O'Loughlin ..	520	141	661	18
10	Black Orpington ..	H. A. Langdon ..	523	136	659	19
67	White Leghorn ..	C. L. Shatman ..	530	127	657	20
36	" ..	F. A. Sillitoe ..	521	131	652	21
1	" ..	A. Brebner ..	513	134	647	22
4	Golden Wyandotte	H. Bell	505	131	636	23
63	Black Orpington ..	A. J. Treacy ..	534	101	635	24
3	White Leghorn ..	K. Gleghorn ..	492	142	634	25
19	" ..	A. Jaques ..	504	128	632	26
22	Black Orpington ..	P. S. Wood ..	488	142	630	27
28	White Leghorn ..	J. Campbell ..	480	148	628	28
49	" ..	W. J. Thornton ..	470	157	627	29
51	" ..	J. W. McArthur ..	520	103	623	30
24	" ..	F. Hannaford ..	498	123	621	31
50	" ..	C. H. Busst ..	480	139	619	32
2	" ..	E. P. Nash ..	459	152	611	33
5	" ..	L. C. Payne ..	477	132	609	34
65	" ..	H. Hammill (N.S.W.)	468	137	605	35
45	" ..	T. Kempster ..	455	146	601	36
27	" ..	Hill and Luckman ..	468	125	593	37
8	" ..	T. W. Coto ..	450	140	590	38
47	" ..	C. W. Spencer (N.S.W.)	452	136	588	39
58	Faverolles ..	K. Courtenay ..	484	101	585	} 40
42	White Orpington ..	P. Mitchell ..	469	116	585	}
59	White Leghorn ..	W. H. Dunlop ..	444	138	582	42
41	" ..	Morgan and Watson ..	454	125	579	43
60	" ..	J. J. Harrington ..	446	129	575	44
43	" ..	W. B. Crellin ..	432	140	572	45
62	" ..	P. Hodson	414	149	563	46
57	" ..	G. E. Edwards ..	404	155	559	47
11	Brown Leghorn ..	F. Soncum ..	422	134	556	48
30	Black Orpington ..	Rodgers Bros. ..	426	128	554	49
6	Silver Wyandotte ..	Mrs. H. J. Richards	402	150	552	50
53	White Leghorn ..	A. Stringer ..	412	139	551	51
52	" ..	W. J. McKeddie ..	412	128	540	52
54	" ..	F. N. Hodges ..	437	87	524	53
16	Silver Wyandotte ..	Miss A. Cottam ..	402	113	515	54
23	Golden Wyandotte	G. E. Brown ..	402	109	511	55
34	White Leghorn ..	E. Dettman ..	372	136	508	56
26	" ..	F. Seymour ..	369	119	488	} 57
35	" ..	J. H. Brain ..	343	145	488	}
7	" ..	H. Stevenson ..	356	130	486	59
61	Silver Wyandotte	J. Reade	351	105	456	60
64	White Leghorn ..	J. D. Read ..	302	144	446	61
56	" ..	Mrs. C. Thompson ..	309	129	438	62
17	" ..	W. J. Eckershall ..	307	125	432	63
14	Black Orpington ..	W. J. Macauley ..	316	109	425	64
15	Minorca ..	H. McChesney ..	230	121	351	65
48	" ..	G. James	151	91	242	66
			31,566	8,815	40,381	

ORCHARD AND GARDEN NOTES.

E. E. Pescott, Principal, Horticultural School, Burnley.

The Orchard.

CARE OF YOUNG TREES.

The care of the young tree at this season of the year is one of the most important of orchard operations. A very considerable number of young trees has been planted out during the past planting season, and it is thought advisable to draw attention to this. Whatever care and attention are given to young trees will be amply repaid to the grower in after years, owing to the vigour, sturdiness, and other qualities thus imparted to them. It is a mistake to plant a young orchard, and, after cutting back the trees, to leave them practically to their own devices, other than following the usual methods of soil cultivation.

The trees, after the early summer cultivation and cleaning of the soil, should be mulched with straw, grass, or leafage of some description. This mulching should not be crowded around the stem, its object being mainly to create moist and cool soil conditions, and to encourage a free root establishment. The mulch material should be occasionally stirred, and no weed or grass growth should be allowed to accumulate amongst it. Where mulching material is not available, a very frequent earth mulch should be given, by constantly stirring the soil within a few feet of the young trees.

In addition to mulching, it will be beneficial to spray the young trees with water wherever possible, particularly on hot or windy days. At such times, the transpiration of moisture from the foliage is very excessive and continuous, and a water spray is thus very helpful to the young trees.

Further, all unnecessary buds should be rubbed off, particularly on the main trunk; and all growths in the centre should be pinched back, so as to force as much sap as possible into the growths which will ultimately form the framework of the tree. Similar attention should also be given to grafted trees; although they may not need mulching to the extent that young trees do, yet the water sprayings and disbudding work will be of great benefit to them.

Ordinary orchard work will now include cultivation. Frequent soil workings will be necessary so as to keep a surface mulch and to keep down weeds.

SPRAYING.

Spraying with arsenate of lead for various pests will now be receiving attention. These include the codlin moth, cherry slug, root borer, looper caterpillar, and various leaf-eating insects.

The question of the number of sprays necessary to keep the codlin moth in check is receiving attention in various parts of the world; and the "one spray method" in the control of this insect is being considerably advanced. Last season, extensive experiments were carried out in three States in America to test this theory. The one spray method has for its basis the indispensable requisite that the inner calyx cup of the very young apple shall be filled with the poison—the young larvæ seeking entrance therein will be killed by endeavouring to eat their way through. Prior to these experiments, Professor Melander reported, in 1909, that a

single thorough spraying had afforded practically 100 per cent. clean returns over hundreds of acres in Washington, Colorado, and Utah.

In the 1910 experiments, very satisfactory results were obtained from the one spray; at the same time, it was concluded that further experiments and investigations were needed before final conclusions would be reached. It was also decided that the filling of the calyx cup with poison is of prime importance.

If it could be shown that, in Victoria, the codlin moth laid her eggs invariably in the calyx, the one spray method would be of extreme importance. But it has been already noted that the moth, with considerable frequence, places the eggs on the sides of the fruit, and also on the foliage. Consequently, under such conditions, the one spray method would appear to show a weak spot.

It would be interesting to determine, in each zone in the State, the exact number of sprays really necessary to keep this pest in check. Experiments are now in force at the Burnley orchards to this end, and reports will be made at the end of the season.

Vegetable Garden.

Constant cultivation (especially with the hoe), weeding, and watering will be the principal duties at present in the vegetable garden.

Tomatoes will require frequent manuring and watering. Keep all unnecessary laterals pinched out, and also pinch the tops when the main growth is long enough. In the early fruiting varieties, such as Earliana, a vigilant watch will need to be kept for the tomato black spot. All immature ripening fruits should be well examined for this. Diseased fruits should not be thrown on the ground, to cause re-infection; they should be burned.

Pumpkins, marrows, melons, and similar plants will require a considerable quantity of water, keeping excessive laterals and runners pinched out.

Asparagus beds should now be allowed to mature their growths, ceasing to cut the stems. A mulching with stable manure will be helpful. Hoe and clean all potato and onion beds; plant out seedlings of all kinds, and sow seeds of cabbage, cauliflower, French beans, peas, lettuce, &c.

Flower Garden.

All spring flowering bulbs that have ripened their foliage may now be lifted, if required, and stored for a few months. It is not necessary to lift all classes of bulbs. Daffodils and similar bulbs may remain in the one location for some years. But it is generally necessary to make annual or at least biennial inspections of hyacinth and tulip bulbs, to prevent their rotting.

Dahlias may now be planted out, particularly those that are being grown for exhibition and for late blooms. The roots should be well watered when planting.

Seeds of zinnias, cosmos, asters, and other autumn flowering annuals may still be sown, sowing in the open being now preferable. Carnations, camellias, daphnes, and other plants hard to strike from cuttings, may now be layered.

Rose plants may now be somewhat neglected. It will be advisable to mulch the bushes with a light mulching material at the present time, withholding the water supply for the present.

All weak and tall plants should be staked and tied securely to prevent breakages. The summer heat and winds are responsible for a considerable loss of moisture from plants, and they are correspondingly weak; consequently, support will be needed.

The soil should be frequently stirred, watering and hoeing being continually carried on, except in the rose beds. Surface cultivation must always be thorough, leaving the soil well broken up.

IMPROVISED MOTOR SPRAYING.

E. E. Pescott, Principal, Horticultural School, Burnley.

To the orchardist who carries on fruit-growing operations on upwards of 15 acres, a motor pump is one of his present day necessities. The motor pump is easy to manage, and is a great saving of labour; the work

IMPROVISED MOTOR SPRAYER.

of spraying is also performed with much greater speed than formerly. The cost of motor pumps seems at first glance somewhat prohibitive; but when it is considered that two men can do the whole of the work, and that the time saved is a very great consideration, it is not long before the machine pays for itself.

Some orchardists and agriculturists have ingeniously made use of their motor cycles for the purpose of power work, and apparently the motor cycle engine is very useful for this object. In the August, 1907, number of the *Journal*, Mr. J. M. B. Connor gave a description, illustrated, of the power of a motor cycle being adapted for working the chaff-cutter. In this instance, a $2\frac{3}{4}$ h.p. motor cycle was used for driving a two-bladed chaff-cutter, which supplied cut food for a herd of 30 cows.

It has remained for Mr. H. Vince, of Bridgewater-on-Loddon, to show how the motor cycle may be utilized as an improvised motor spray pump. Mr. Vince's motor cycle is an ordinary 3½ h.p. machine, and when utilizing the power for spraying purposes, it is attached to a wooden triangular frame in such a way that it can be easily disconnected; at the same time, this frame gives a solid bed to prevent excessive vibration. The cycle wheels, handle bars, and saddle are removed, to prevent oil and caustic sprays from damaging them. The machine is then fitted on to a two-wheeled dray, along with an ordinary barrel spray pump. The pump is driven by a belt off the engine pulley, over the large wheel which is shown in the illustration, the axle of which has a crank which works the pump.

Mr. Vince uses a fan, cut out of a piece of tin, and attached to the outside of the engine pulley, to keep the cylinder cool. The cycle is covered with a tarpaulin, when necessary, to prevent any spray material from settling upon the various parts.

Mr. Vince's orchard has an extent of upwards of 60 acres, and the whole of his spraying is done with the motor cycle power. The machine works at a pressure of from 150 to 180 lbs., and the motor will run all day with but little attention. It can be disconnected in a few minutes, and again shortly transformed into a motor cycle.

By this ingenious means, not only is the spraying done more expeditiously, but the drudgery of hand pumping is done away with, and the labour of one man is saved; it requires but two men to attend to the horse and machine, and to do the spraying.

PROPAGATION OF FRUIT TREES.

(*Continued from page 702.*)

C. F. Cole, Orchard Supervisor.

TOP OR HEAD GRAFTING.

This mode of grafting is largely practised upon the apple in the nursery row. If a variety does not sell by the time the young trees are two years old from graft or bud, the operator, by heading them off first below the branches and adopting this method, may have another tree of a desired variety within six months.

Top graft the young trees about 18 in. above ground level. A top graft put on in the spring is equal by the following winter to a two-year-old tree from bud. Fig. 43 shows a young tree so treated carrying a graft with five months' growth (defoliated). The variety is Rome Beauty.

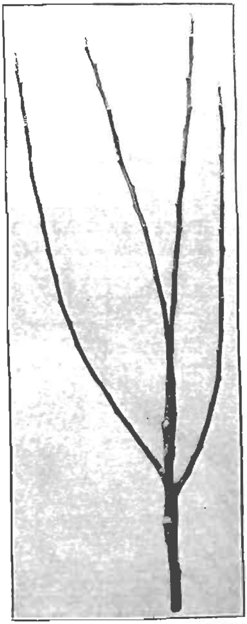
When selecting scions for this method, see that they carry all wood and not bloom buds so as to form a uniformly branched head (Fig. 45). In Fig. 44 a scion carrying three bloom buds and one wood bud has been used; consequently, a tree with a poor head growth is being formed. Consequent on this the wood bud is breaking away and drawing the sap. This reduces the elaboration of sap to the bloom buds and causes the fruit to set. The probable result will be a short lateral growth shooting forth from the bloom spur during the summer (Fig. 44).

The reformation of such a type and the bringing about of uniform head conditions, by pruning, will depend solely upon the wood growth having suitable buds at the base on which to operate. That part of the scion, and also the strong oblique growth, should be hardened back to the basal

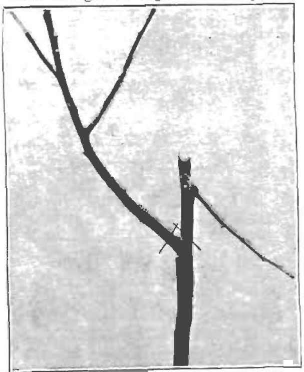
parts where indicated by lines in Fig. 44. The aim of the operator is to get a straight vertical growth. Having secured this latter growth, the following winter it should be cut back to within four buds from the base. Such buds will produce the desired uniformity of head.

The quicker and better way is to re-graft. This can be performed after the young tree is planted out permanently in the orchard, and when the buds are starting to move. Such a type would not be satisfactory to a nurseryman or to a purchaser. If the stem of the stock or young tree to be operated upon is not very thick, the cut should be made straight through, similarly to the scion, and long enough to insure the latter being vertical when placed in position. If, on the other hand, the stock should be somewhat large, make the cut straight through and then back off at the terminal end of the cut (Fig. 45 *a*). The length of the cut should be from 1¼ in. to 1½ in. when ready for placing the scion in position.

With Figs. 46 *a* and *b* the cuts upon the stock and scion are too short, being made straight through. When placed together, the positions will be far from vertical. Fig. 46 *c* shows the position of scion when placed upon the stock. The terminal cut upon the scion at the bud is faulty. The reader should contrast Fig. 46 *a*, *b*, *c*, with Fig. 45 *a*, *b*, *c*. If the cuts are roughly made and carelessly placed together when grafting, the probable result will be a stunted head growth from the scion. Fig. 47 shows the result from such work; the head growth is three years from the



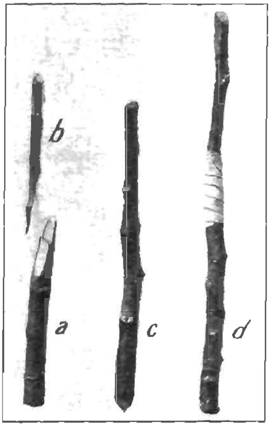
43. TOP OR HEAD-GRAFTING METHOD, FIVE MONTHS' GROWTH OF SCION.



44. RESULT OF WRONGLY SELECTED SCION.

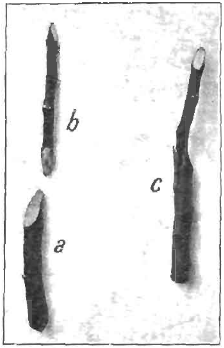
time it was grafted. The reader should carefully examine the rough union between the stock and scion and contrast it with Fig. 43 which shows a clean healthy head growth of five months.

After placing the scion in position, take a strip of waxed calico or paper and start binding, with a firm hand, just below the lower end of the union. Work upwards obliquely, taking care that each time the binding comes around the union that one edge overlaps the other. Continue on above the union and give one turn straight around the scion, finishing off with a downward turn (Fig. 45 *d*). When this is accomplished work the thumb and fingers firmly, but carefully, around the bound parts. This will not only expel any air, but by working the wax well into the material used, will lessen the danger of the binding becoming slack. Work with the binding, not against. If the air is not prevented from gaining access to the uniting parts, the graft will be a failure.



45. SATISFACTORY GRAFTING.

a. Stock prepared for scion. *b.* Properly cut scion. *c* Scion and stock united. *d.* Bound with waxed calico.



46. UNSATISFACTORY GRAFTING.

a and *b*. Stock and scion wrongly cut. *c.* Result when united.

The failure of a graft when rightly selected, cut, and united, is usually traced to some slight fault, such as the binding relaxing slightly at the terminal or apex end of the union, and thus allowing the air free access to the callusing parts. This relaxation is usually brought about through carelessness, either in binding, finishing off, or using a wrongly prepared grafting wax.

Several varieties of apples are unsuitable for head grafting in the nursery. Those kinds subject to a well known bark trouble which is characteristic of the Cox's Orange Pippin, American Mother, Irish Peach, Missouri Pippin, &c., should be avoided, and so should the Gravenstein with its sunken or crushed-like parts upon the trunk and boughs.

Scions for top grafting should be cut longer than for ground grafting. Leave three or four buds to form the branched head growth. (*See* Fig. 43.)

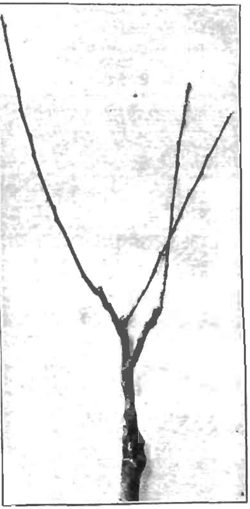
PREPARING BINDING.

When selecting material suitable for binding purposes see that it is strong and pliable. A very suitable material for well cut and carefully united small or medium-sized grafts is the thin brown paper used for wrapping purposes. To test the quality of paper, tear a strip, ½ in. wide, and give a few sharp jerks. If of poor quality it will readily break; but, if suitable for binding, it will withstand a reasonable strain. One good point in favour of using paper is that there is rarely any necessity to ease the binding during the expansion of the scion and stock, as it breaks away of its own accord.

When selecting cotton material, see that it will not give too much when dressing and binding. Old calico, oatmeal bags, or similar material will answer the purpose.

Give the selected material a light dressing on one side with the grafting wax, applying it when melted and hot. Then fold at once, placing the waxed surface of the material together. It will then be ready to cut into the required width and length (average size—¾ in x 6 in.).

Cut with a pair of scissors or a sharp knife. When using the latter, place and cut the waxed material upon a wooden slab or board. Properly prepared waxed paper or calico should readily separate when required for binding. Do not prepare more material than is required for immediate use. It should be sheltered from the rays of the sun.



47. RESULT OF POOR GRAFTING—3 YEARS' GROWTH.

GRAFTING WAX FORMULA.

The chief trouble when preparing the wax is to make it suitable for both warm and cold weather. It is likely in warm weather to be too pliable, and too hard when the weather is cold. This will be avoided by adopting the following formula:—

Boil together, until dissolved, the following:—3 parts resin (pulverized), 2 parts beeswax, and 1 part fat or lard. First place the wax and the fat in the vessel. Be careful that the mixture does not ignite; if it should, do not throw water over it, but smother with a bag or some similar material.

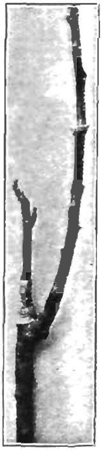
To test whether the prepartion is suitable for using, paint a little upon a piece of calico or paper; after cooling, fold and press the waxed surface together. If too hard and it will not separate easily, add a little more fat. If too soft and will not stick, add more resin. Test in a cool place.

TREATMENT OF GRAFTS.

After the scions have united with the stocks and are making growth, it will be necessary to give them attention. The united scion has now become part of the stock and to all intents and purposes is the same. If, during the early stage of the growing and expanding period, the binding is not treated so that it will gradually expand with the growth, the scion will break off and be lost. This generally happens when the scion has a fair head growth and the weather is windy.

To guard against loss, the grafts should be carefully watched. If the binding is not easing with the expanding growth, the propagator should, with a sharp knife, cut the binding through to the bark for the whole length of the bandage, and upon the opposite side to that upon which the scion is placed. Fig. 48 *b* illustrates the method of making this cut. See that the cut is made through the binding only, and not deep enough to penetrate the bark.

48. REMOVING BANDAGE.
a. Result of premature removal of bandage. *b.* Method of easing bandage.



49. RESULT OF NEGLECT TO REMOVE SHOOT FROM STOCK.

There is a big risk of the scion breaking away from the stock if the binding is removed previous to the callused parts becoming thoroughly hardened. This period is when the growth is hardening and easing off. There is no necessity to remove the binding, if properly attended to. If it does not come off of its own accord, allow it to remain on until the autumn or winter.

As soon as the scion starts to make growth, any shoots upon the stock should be removed, either by rubbing off with the thumb or finger or cutting clean and close to the stem with a sharp knife. If this disbudding is neglected, the shoots below the graft will draw upon the ascending sap

and starve the scion. In Fig. 49, a shoot just below the graft has been allowed to remain, consequently utilizing the sap. The result is that the scion is starved; it only receives enough nourishment to keep it barely alive.

Very often, when disbudding young trees in the nursery that have been top grafted, a bud upon the terminal end of the cut upon the stock pushes forth and, being overlooked, forms a branch. The result is that, when removed and planted permanently out in the orchard, it is allowed to remain, the growers being under the impression that it belongs to the variety planted. The propagator should closely guard against this as there is a big risk of mixing varieties and causing confusion, particularly if they resemble one another in wood, growth, &c.

With ground grafts, the buds upon the scion should be allowed to make some inches of growth before removing the superfluous ones. If the growth from the terminal bud upon the scion is not strong and vigorous, another may be used to form the tree. If it is necessary to stake the growing shoot to insure a vertical growth, be careful not to knock or displace the scion. During cultivation operations amongst grafts, the utmost care should be taken that the scions are not interfered with, or the growing shoots that form the tree injured.

DWARFING.

The dwarfing of fruit trees is brought about chiefly by budding or grafting, a stock of slower growth than that of the scion being used. The stock must also be allied to the selected bud or scion.

To dwarf the apple, it is necessary to use a variety known as French Paradise, or Doucin. Owing to this variety being subject to Woolly Aphis, it must be first grafted upon the Northern Spy or some other suitable variety that is immune to the attacks of aphis, so as to give the tree a sound blight-proof system. Then the variety desired for dwarfing should be worked upon the Doucin. Trees propagated upon this stock are only suitable for planting in small gardens.

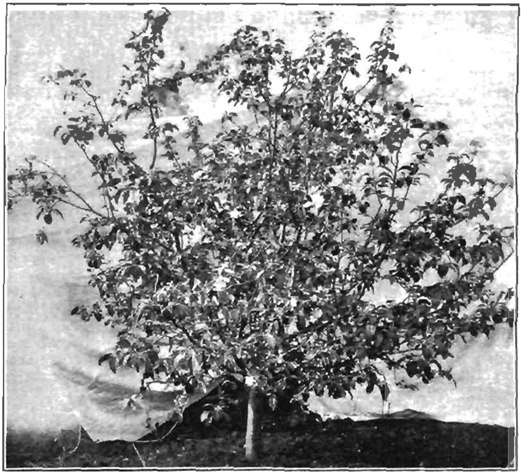
There is another variety known as Cole's Blight-proof Paradise dwarfing stock. The dwarfing influence of this variety is not so pronounced as that of the Doucin; it is more of an intermediate between the latter and the Northern Spy. To apply the word "dwarf" to it is somewhat misleading. Although it is a good sturdy grower, and has a perfectly sound root-system, all varieties will not make medium sized trees upon it. This is principally due to the soil and environment not suiting the stock. Upon strong growing soils, and in localities where apple trees worked upon other stocks make rank growth but are not very productive, the result should be satisfactory, provided a fair trial is given.

It is not necessary for the grower to plant a large area in order to test whether this stock is suitable for the district; one tree of a selected variety is ample.

When propagating upon this stock work direct, the same as if using the Northern Spy. To give readers some idea as to the size trees of certain varieties will grow when worked upon Cole's Paradise stock, the writer has obtained photographs of two trees growing in a private garden in the metropolitan area. The soil is a medium heavy dark-grey loam, overlying a somewhat compact impervious clay subsoil. The trees receive

ordinary treatment, no chemical manures being used. Fig. 50 is the well-known variety, Jonathan. After allowing for windfalls, &c., this tree during the 1911 season produced four 1-bushel cases of sound marketable fruit. The fruit kept exceedingly well when stored, and showed no signs of bitter or superficial pit. Fig. 51 is the variety Reinette de Canada. It also had a good crop and when photographed promised well for the coming season.

Where conditions are the same or similar to those already stated, the writer recommends growers to give a trial to those varieties that overgrow



50. JONATHAN APPLE. GROWN ON COLE'S PARADISE STOCK.
Eight years old. 10 ft. high; 8 ft. across.

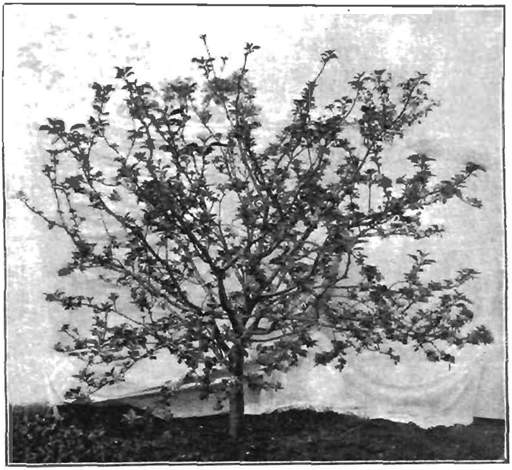
and are unproductive, such varieties to be worked upon this stock. Besides, more trees per acreage may be planted, if necessary.

The pear is usually dwarfed by using the quince as a stock. As many varieties of pears do not flourish when worked directly upon the quince, it is necessary to use the pear as an intermediate stock, *i.e.*, by first working strong growing varieties, like Beurré d' Amanalis, Jargonelle, Vicar of Winkfield, &c., upon the quince, and then working the desired variety upon the pear. Pears worked upon the quince should not be grown upon dry or sandy soils, especially in localities where the rainfall is limited; if so, the probable result will be disappointing.

There are other stocks used for dwarfing, but they have no advantage over the quince. The following kinds, when used as stocks, have somewhat

of a dwarfing influence upon others, viz., plum stock upon the peach, nectarine and almond; peach stock upon the apricot; Kentish and Cerasus Mahaleb cherry upon the cherry; *Citrus trifoliata* upon the citrus family.

Certain kinds of fruits—apples, pears, &c.—may be checked and dwarfed by root-pruning, *i.e.*, by digging a trench around the tree a suitable distance from the base of the trunk, and then working beneath the same as if lifting the tree with a massive ball of earth. When performing this operation, care should be exercised that the roots are cleanly severed, and that no top roots are left uncut. The distance of opening out the



51. REINETTE DE CANADA APPLE. GROWN ON COLE'S PARADISE STOCK.
Eight years old. 8 ft. high; 10 ft. across.

trench from the base of the trunk is controlled by the root conditions. A tree with surface spreading roots requires to be opened out a greater distance away than one having its roots growing downwards.

It may be necessary to follow up this operation again within two years or so; this is controlled by the future conditions of the growth made. When finished, replace the soil at once. This operation should be performed in the winter and not until the trees are of a desired size. Do not prune or cut back the growths until the winter following this operation, and then lightly prune. By balancing the root and top, through cutting, strong growth is encouraged.

(*To be continued.*)

THE OLIVE.

L. Macdonald, Horticulturist, Dookie Agricultural College.

A NEGLECTED INDUSTRY.

Up to the present the olive has not received the attention which its importance as a sub-tropical fruit demands. With the possible exception of South Australia, this is evident in every other State in the Commonwealth. This neglect is due to many causes.

The chief ones, probably, are that our rural population is made up mainly of those nationalities that are unaccustomed to the use of its products. The average Britisher or northern European does not appreciate fully the value of olive oil in the cuisine or as a medicine; nor the pickled olive as an adjunct to the diet. This, no doubt, is simply through being unaccustomed to its use. Then the greater prospects of ready profits in other branches of agriculture, the wait of several years before returns can be expected, the lack of knowledge regarding its culture, and the treatment of its products, have all added their deterring influence, to the detriment of expansion of the olive industry. Yet, we feel certain that it is destined to assume important dimensions as a rural industry in Australia.

1. OLIVES IN BLOOM, DOOKIE AGRICULTURAL COLLEGE.

Probably, in no country in the world, could the olive be more universally grown than in Australia. I have found it flourishing, often without attention, in many out of the way places in this State, where many other fruit trees would perish. Our climate and large tracts of our lands are entirely suited to its growth, and there can be no gainsaying the fact that the oil made locally is equal, if not superior, to that manufactured in other parts.

So little attention has this industry claimed as yet, that only one of the Australian States publishes returns of local production, *i.e.*, South

Australia. The following figures represent in gallons the quantities of olive oil that have been produced during the last ten years in that State:—

Olive Oil Production in South Australia.

Year.	Gallons.	Year.	Gallons.
1900–1	6,520	1905–6	17,762
1901–2	11,327	1906–7	16,164
1902–3	12,422	1907–8	16,954
1903–4	11,864	1908–9	12,998
1904–5	15,980	1909–10	16,464

It may be noted that the year 1909-10 was, with two exceptions, the best since the inception of the olive industry in that State as far as production is concerned. Yet, 15,753 gallons of oil were imported into South Australia during that period, which is the record importation for any one year. The following figures indicate the quantities imported into the Commonwealth during the last five years:—

Imports of Olive Oil into the Commonwealth.

State.	1906.	1907.	1908.	1909.	1910.	Total (5 years).
	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.
Victoria	13,038	15,300	16,425	12,883	17,297	74,943
New South Wales ...	14,531	19,058	17,247	21,273	25,986	98,095
South Australia	4,111	8,256	9,442	12,013	15,753	49,575
Queensland	876	861	931	901	997	4,566
Western Australia .	3,357	2 162	4,111	1,884	3,512	15,026
Tasmania	247	244	781	251	105	1,028
Total for Commonwealth ...	36,160	45,881	48,337	59,205	63,645	253,233

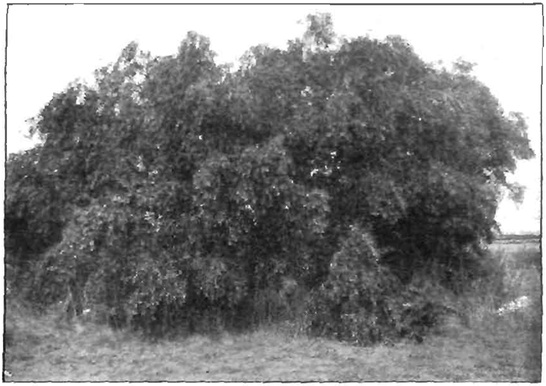
The above figures show a steady increase in the importation of olive oil, despite the fact that the Commonwealth duty amounts to 2s. per gallon. This increase is most marked in New South Wales. Notwithstanding the sheltering barrier of protection and the increased prospect of profits, records are not available to show a warrantable increase in the extension of plantations.

No returns are available in the different States respecting the importation or production of pickled olives, as they come in with other pickles and are not separately recorded. It is manifest, however, that considerable quantities of these pickles are imported, and if their value could be ascertained it would doubtless be found that a steady increase had been made, showing that the demand for such, though slow, is improving.

THE OLIVE IN AUSTRALIA.

As yet, the history of the olive in Australia is a brief, though perhaps a somewhat chequered, one. It was first introduced into South Australia in 1844 from Marseilles by the South Australian Company. Some fifty plants, comprising five varieties, were imported at that time. Oil obtained from the produce of these trees was exhibited at the London Exhibition as early as 1851, and was favourably commented on.

Some years later a number of extensive plantations were made, notably "Beaumont," originally planted by the late Sir Samuel Davenport, an enthusiastic advocate of the olive; "Stonyfell," then owned by Mr. Crompton; His Majesty's gaol; and the park lands around Adelaide. The Stonyfell plantation, comprising 100 acres of uniformly well-grown trees, is situated on the hills a few miles out of Adelaide. The property is owned at present by the Stonyfell Olive Company Ltd. The secretary, Mr. Owen Crompton, informed the writer that during last year truncheons were distributed sufficient to plant considerably over 50 acres. The original plantation in the Beaumont Estate is still bearing well, while the present owners, Messrs. G. F. Clelland & Sons, are extending the area under olives. Smaller plantations are scattered about in various parts, and frequently trees may be met with as shelter belts or hedges.



2. OLIVE TREE CARRYING 4½ CWT. OF FRUIT, DOOKIE AGRICULTURAL COLLEGE.

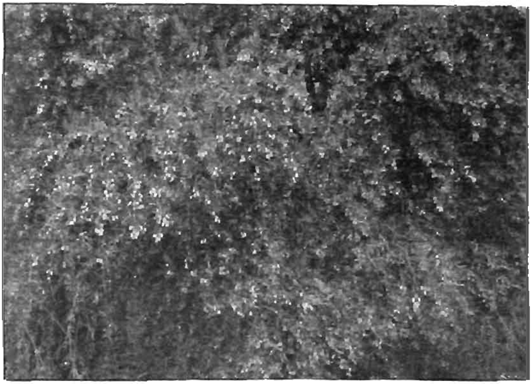
Up to 1906-7, records of the number of trees planted out in South Australia have been kept in that State. Apparently, they have been discontinued since that date. The following are the available figures:—

Year.	No. of Trees.	Year.	No. of Trees.
1900-1	61,740	1904-5	83,138
1901-2	66,852	1905-6	85,433
1902-3	78,812	1906-7	83,153
1903-4	80,560		

Although the records show a slow increase in the number of the trees planted, a steady, corresponding increase is not found in the returns for production. It is manifest, therefore, that a large number of trees must be used for shelter or ornamental planting, and the produce from them is finding its way to the market.

In Victoria, olive culture has as yet received but scant consideration. However, a growing demand exists for some tree suitable for shelter planting that is also of some economic value during its lifetime. The olive has many qualities that commend it for those purposes. Well established trees may be found growing in widely distant parts of this State, *e.g.*, at Ardmona, Bendigo, Dookie, Echuca, Horsham, Kyabram, Mildura, St. Arnaud, and Wangaratta, showing that it will adapt itself readily to a great range of soils and conditions.

The planting of olives was started in the seventies of last century at the Dookie Agricultural College. They were imported in the form of truncheons, which for the voyage out from Europe were packed in damp moss and covered with oiled paper. On their arrival they were planted out in nursery rows and not



3. SECTION OF TREE SHOWN IN NO. 2.

one failed to strike; the next season they were planted out in their permanent positions. Ten varieties were obtained. The bulk of the consignment was, however, composed of the two varieties known as Rubra, the "Caillet Olive," and Polymorpha, the "Weeping Olive." Although the varieties mentioned are not heavy oil producers, the quality of the oil obtained from them is excellent. A number of varieties that show a higher oil test have been added of late years, including two trees of the Herbequina variety, introduced by Mr. F. de Castella. The latter variety is noted in Catalonia (Spain) for its oil-producing qualities.

The area in Victoria under olives, and the uses to which the produce is put, are not available. However, statistics are collected every three years, showing the number of trees planted out. The following are the returns: —

Year.	No. of Trees.	Year.	No. of Trees.	Year.	No. of Trees.
1902	3,743	1905	4,402	1908	3,817

As no returns are available regarding the quantity of oil produced, their commercial value cannot be estimated. It is obvious, however, that not

much of the produce is finding its way to the market, as is the case in other States. At the present time, the only two places in Victoria where olive oil is manufactured in a commercial way are, I believe, Dookie Agricultural College and Mildura. Olive growing was started much later in the latter place than in the former.

In New South Wales, some valuable work has been done, and is still being done, in testing the olive in different parts. This is advanced most, I believe, at the Wagga Experimental Farm, where a number of selected varieties are growing. However, these plantings are as yet small and in widely scattered parts. No particulars regarding the production of oil (if any) are available.

Botanical Note.

The numerous varieties of olives in cultivation to-day are descendants of, or varieties from, the original species *Olea europæa*, which belongs to the natural order *Oleaceæ*. Some doubt has existed among botanists regarding the original habitat of this species. It is now more generally accepted, however, that it is a native of Asia Minor. According to de Candolle, it was introduced from that place, by immigrants, into Greece, Italy, and other countries bordering on the Mediterranean. It has again been taken, mainly by people of Southern Europe, to different countries scattered practically all over the more temperate regions of the world.

Different species of *Olea* are found in several of the warmer countries of Asia and Europe; in the West Indies and Mauritius; one in North America, and two in Australasia. The two species native to Australasia are *O. paniculata* (R.Br.), commonly known in different localities as Marble Wood, Native Olive, Iron Wood, &c.; and *O. apetala* (Vahl), the "Maire" of New Zealand. We have also several species of *Notelæa*, which belongs to the same order. These are known variously by their vernacular names as the Silkwood Olive (*N. ligustrina*), Queensland Olive (*N. ovata*), and Mock Olive (*N. longifolia*). These trees must not be confounded with the true native olives, nor yet should the Olive Plum (*Elæodendrum melanocarpum* and *E. australe*), or the Olive Berry Tree (*Elæocarpus cyaneus*), as they belong to different orders.

The order *Oleaceæ* comprises 17 genera and at least 124 species, which have a very wide distribution. Some botanists include in this order the Jasminum, which resembles the olive in many respects, but the latter is now more generally separated with the Nyctanthes, under the order *Jasmineæ*, which contains about 50 species.

Not only does the natural order to which the olive belongs provide us with a tree of the very first economic importance, and several others of lesser importance, but it supplies many of our well-known garden shrubs and ornamental trees, such as the Privet (*Ligustrum*), Fringe-Tree (*Chionanthus*), Jasmine Box (*Phillyrea*), Lilac (*Syringa*), Flowering Ash (*Fraxinus ornus*), and the Common Ash (*Fraxinus excelsior*). Nearly all of the members of this order are very easily propagated by cuttings or layers.

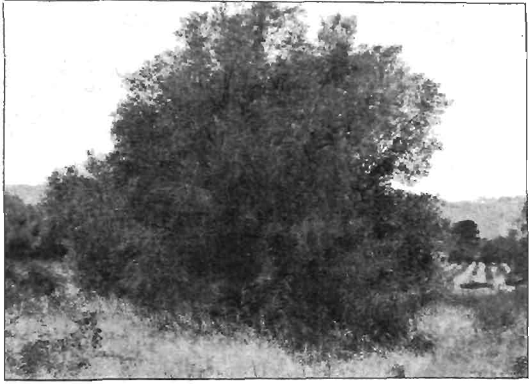
Climate.

The cultivated olive is undoubtedly one of the most hardy and adaptable of trees. Although grown for ages in the countries bordering on the Mediterranean, it has been carried from this region to various parts of the world where the climate is found to be similar.

As yet, the number of olives in this country is comparatively small. At the same time, they are scattered over a very wide area, and are sufficient to indicate the effect of our conditions on the olive. If one is to judge by the contentment and general thriftiness of the tree wherever it is met with,

it cannot be doubted that our soils and climate are eminently suited to the olive. Of course, like many other trees, the olive will grow well in places where it will not fruit profitably; and, in this connexion, there is room for experiment in determining its peculiarities. It was believed by some that the trees would not fruit well beyond 90 miles from the sea. This idea, however, has proved to be entirely erroneous, and in several places in Australia it is fruiting some hundreds of miles inland. In fact, it flourishes so well in our semi-arid inland districts, especially where irrigation is available, that it is doubtful if it would do better, or even as well, in the coastal districts where the annual rainfall is good.

The olive succeeds best in a warm, somewhat dry climate, where the temperature does not fall blow 20 degrees F. It is inadvisable to plant in districts where the thermometer gives a lower register than this. Severe frosts seriously damage the trees, 10 degrees F. being said to prove fatal.



4. ONE OF THE TWO ORIGINAL TREES PLANTED BY SIR S. DAVENPORT. BORE 7 CWT. IN 1910.

Many of the plantations in France were killed in January, 1820, owing to this cause. A temperature of 14 to 18 degrees F. usually causes serious damage, particularly if it occurs in late winter or early spring, when the new wood is on the trees. Injury to the fruit usually takes place at about 24 degrees F.; this is especially so with some varieties. It will be seen then that the climatic conditions of the greater part of inland Victoria, where the elevations are not great, will be found suitable for olives. These conditions also extend over enormous areas in the other States.

SOIL.

Owing to its thriftiness and tenacity of life, it is thought by many that the olive tree does not require good soil. This is, however, a mistaken idea. It is due in a measure to its adoption in many of the older countries for the utilization of waste spaces or infertile land. Its hardihood in this respect has been the means of appreciating the value of many poor hillside lands

that could not be cultivated for the growth of other crops. The olive will grow on hillsides, among rocks, and on poor soil where many other trees would fail ; yet, at the same time, there are few trees that respond more to

5. OLIVES AS A SHELTER BELT.

good treatment. Hence the olive succeeds best on good soils, especially those deep *alluvial soils* that are rich in *lime* and *potash*. *It does not fruit* so well on the full-bodied nitrogenous soils—in many of our coastal districts it runs more to growth.

6. TWO-YEAR-OLD OLIVE TREE, EXPERIMENTAL NURSERY, SOUTH AUSTRALIA.

Many thousands of acres in this State, especially the sandy loams of the inland districts, are entirely suited to its growth. Most of the "Murray Pine," "Belar," and "Big Mallee" country adjacent to the Murray would

be found suitable; however, the greater portion, perhaps, of these lands would have to be irrigated during our dry summers. Through the greater part of the Goulburn Valley, where a fairly wide range of soils will be met with, olive trees will be found in isolated places making good growth and bearing good crops, even in some cases where no cultivation is carried out. The trees are therefore not fickle as to soils, although succeeding best under the most genial conditions, and when once established they will withstand drought and neglect that would quickly kill out the majority of our other fruit trees.

IRRIGATION.

It is possible that, in years to come, with a largely increased population, the result of closer settlement, that olive culture will attain a position similar to that which it enjoys as a staple industry in many of the older countries. Many of our inland areas that have an annual rainfall of 20 to 25 inches are suited to unirrigated olive culture. This would, of course, entail careful cultivation and conservation of all available moisture. In a large part of the Goulburn Valley, where the rainfall approaches the above figures, olives are found to thrive. It is therefore possible that good results might also be obtained in parts of those areas in Northern Victoria where the rainfall is between 10 and 20 inches. The introduction of drought-resisting varieties would no doubt enhance the chance of success in these regions. However this may be, it is fairly certain that, for the present, and for years to come, we must look to the varieties we have and to irrigation to make the conquest of these dry lands.

It is manifest in those older European countries where irrigation has been practised for many years, also in Arizona and California, in America, that the olive thrives when well watered, no matter how hot and dry the climate. The same results are evidenced in Mildura, Renmark, and several places in Rodney. Not only does it thrive well in the hot dry districts under irrigation, but it comes into fruiting earlier than in the wet districts. This is, no doubt, due to the better maturation of the wood under dry conditions.

Fig. 6 shows a tree two years old over 6 feet in height, with a proportionate breadth. This tree was grown under irrigation, and was carrying several fruits. The writer has, however, known five-year-old trees in other places carrying good crops. It is believed that in the warm districts, under irrigation, crops could be confidently expected from trees of that age. Although it is generally considered that the olive does not come into fruiting early, it has been demonstrated that under irrigation, where good growth is made and proper pruning takes place, the trees will come into fruiting as early as a number of our other fruit trees.

With the progress that has been made in the North of late years with irrigation and the ultimate extension that must take place if our Northern plains are to yield their latent harvests, olive culture must eventually extend; following, so to speak, in the trail of closer settlement. There are few trees, in fact, more suitable for ornamental, shelter, and economic planting, and few that thrive better under irrigation. The State Rivers and Water Supply Commission has already obtained several hundred trees for the initiation of ditch planting. When once established alongside the channels these trees ought to do well, and will eventually convert to prolific use strips of land that at present are waste.

(To be continued.)

TOBACCO CULTURE.

(Continued from page 673.)

T. A. J. Smith, Tobacco Expert.

SUMMARY.

In concluding this series of articles on tobacco culture, in which most of the essential points in connexion with the production of the crop have been dealt with, I desire to emphasize the fact that the consumption of tobacco is consistently on the increase all the world over. Consequently, the markets for good leaf are more likely to improve than deteriorate as time goes on, and the prospects before the industry are therefore good.

CIGARS MANUFACTURED FROM VICTORIAN-GROWN LEAF.

Only a few districts in Victoria have so far taken up tobacco growing as a commercial enterprise, and in these fine profits have been made. There are many parts of the State which possess suitable soils and climates, some of which may at any time produce leaf of better quality than any yet produced. But, until these are exploited, no results can be expected.

Land fitted to produce high-grade leaf need not necessarily be high priced, and the cost of proving the crop is slight, as a very small area under tobacco is sufficient for the test. No machinery beyond that already used on the average farm is required, and the labour involved is light right throughout. It is a crop that lends itself to the system of mixed farming, and is especially suited to places situated a long distance from the market centres, owing to its high value per ton, and good keeping qualities.

There is no reason to doubt that many thousands of pounds' worth of tobacco leaf could and should be grown in Victoria, but it rests largely with the land-owners to establish the industry, in which effort the Department of Agriculture is willing to assist by supplying any information that may be desired by applicants.

Any person with average intelligence can grow tobacco; at the same time, brains will always assist those who aim at producing something better than their neighbours' crops. An effort should always be made to grow, cure, and treat the crop to the best possible advantage in order to obtain the highest qualities attainable in whatever type or class of leaf.

I am indebted to the works of Messrs. Killibrew, Myrick, and Milton Whitney for much valuable information relating to tobacco culture in America, with respect to soils, moisture contents, &c. This I have endeavoured, as far as possible, to apply to local conditions, of which, as a grower, I have had 30 years' experience.

EYE COMPLAINTS IN HORSES.

E. A. Kendall, B.V.Sc., Veterinary Officer.

The following description of two forms of eye complaints in horses, recently met with in the northern district of Victoria, will doubtless prove of some interest to readers of the *Journal*, more particularly those who are owners or breeders of horses.

As there are several peculiar and interesting features in connexion with these complaints, it is proposed to first outline the class of animals affected, and the condition of the eyes when examined; and, subsequently, to add some remarks based on information concerning them. The accompanying drawings will assist the reader to follow the description of the complaints.

Case No. 1.—A black filly foal, born on 20th October, 1910. This animal, well-conditioned and sound in all other respects, has arrested development of both eyes and was born in this condition.

In place of the natural globes of the eyeballs, there is merely a globular fleshy mass surrounded by the natural red lining (conjunctiva) of the eyeball and lids. That portion known as the "white of the eye," and which normally forms the outer coat of the eyeball itself, is practically non-existent, having become a part of the fleshy mass referred to; while the usual clear "watch glass" front of the eye is replaced by a small bluish lump, about the size of a black currant, standing out prominently in the centre of the mass. Needless to say the foal is totally blind.

Case No. 2.—A grey light mare, aged 14 years, and dam of the filly foal referred to. This animal is affected with old standing "cataract" in the off eye, while the front portion of the near eye has been accidentally destroyed. The mare is quite blind and was so when she came into the owner's possession some 20 months ago.

Nothing is known of her previous history, except that she was bought in-foal at Echuca, and is believed to have come from New South Wales. This foal, now a yearling, is running in the same paddocks as the mother and her last season's foal (No. 1 case), but so far shows no defects in the eyes.

Case No. 3.—A chestnut light mare, aged 12 years. This mare shows well marked cataract in the near eye, the off one appearing normal. She was bred by her owner who also owned both sire and dam, which lived to old age without so far as can be gathered anything amiss being noticed with their eyes. This mare has not had any foals.

Case No. 4.—A bay light mare, aged 15 years, full sister to No. 3, and with foal at foot. She was also bred by the owner. Both eyes in this case are affected with cataract of at least three years' standing, and the mare is totally blind in both eyes. Two foals have been bred from her since she became blind, but up to the present their eyes appear to be normal.

The foregoing cases are all the property of one owner.

Case No. 5.—Bay medium draught mare, aged 4 years, belonging to a brother of the owner of the preceding cases, who resides in the same neighbourhood. This mare also has well marked cataract in both eyes. She is in no way related to the others, though bred in the district. Her sire and dam still survive, and belong to the district, but there has been no opportunity for examining them, so the statement has to be accepted that their eyes have not been noticed to be wrong in any way.

It will be as well here to give some information as to what the conditions met with really are. To begin with, a short reference will be made to the structure of the normal eye, the various parts of which are indicated in Fig. 1. This represents the normal horse's eye, seen on section from front to back. The eye is made up as follows:—

A. The cornea or watch glass—front of the eye. This is exposed to view when the lids are naturally open and is normally quite clear to allow the light to pass into the deeper portions of the eye.

B. The front chamber or cavity behind the cornea which is filled with transparent fluid which transmits light and preserves the shape of the front of the eyeball.

C. The iris or inside curtain of the eye pierced by an elliptical opening, the pupil, which enlarges or reduces in diameter according to the strength of light passing through.

D. The elliptical open space in the centre of the iris, called the pupil.

E. The lens of the eye—a bi-convex structure; jelly-like and transparent—through which the rays of light are bent to concentrate on the back curtain and nerve of the eye.

F. Main cavity of eyeball filled with thin transparent jelly-like fluid which transmits light and preserves the shape of the larger back portion of the eyeball.

G. Retina or back curtain of the eye, which receives the impressions of light or objects and transmits them by the optic nerve to the brain.

H. The optic nerve which carries impressions to the brain.

I. Outermost coat—the sclerotic or "white of the eye"—covering the whole eyeball, except the front transparent portion.

J. The middle coat of the eyeball—the choroid—which lines the inside of the "white of the eye" and is joined to the iris in front.

K. Eyelids.

A study of the foregoing details will enable the reader to more readily understand the nature and situation and peculiar characters of the affections.

In case No. 1, the appearance of the eyes, already described, is very suggestive of a blighting process having in some way affected the primitive eye substance at an early period in its development. This process, apparently, while not destroying the actual elements of the eye, has seriously interfered with their natural growth and development to such an extent that the portion which represents the "white of the eye," besides assuming a fleshy character, has grown at a greater rate than that which should ultimately have become the transparent front of the eye. The result of this is that the former has closed in on the latter, so as to pinch it up and shut it out of its proper place.

Though totally blind, the foal is growing quite satisfactorily and manages to get along surprisingly well. It seems also to be sensible to the contrast between lightness and darkness, though, curiously enough, when moving about, it invariably turns in circles to the right.

As previously mentioned, the foal is the progeny of No. 2 case, which is suffering from cataract. Whether this is merely a coincidence or not, I am not at present able to state. Further observations and investigation may possibly throw some light on the matter. The sire of this foal had no defect in the eyes.

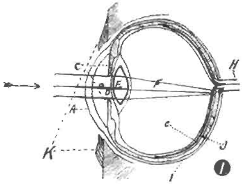


FIG. 1.—VERTICAL SECTION OF THE EYE FROM FRONT TO BACK, SHOWING NORMAL LENS AND OTHER STRUCTURES.

a. Front of eye—cornea—clear and transparent. *b*. Front chamber. *c*. Iris or inside curtain. *d*. Pupil or open space in centre of iris. *e*. Lens, normally transparent. *f*. Main cavity *g*. Retina or back curtain. *h*. Optic nerve. *i*. White coat. *j*. Middle coat. *k*. Eyelids.

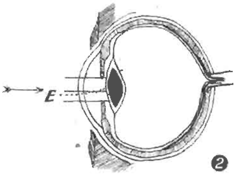


FIG. 2.—VERTICAL SECTION OF EYE FROM FRONT TO BACK, SHOWING LENS AFFECTED WITH CATARACT.

e. Lens affected with cataract, marked black. Other structures normal as in Fig. 1.

With regard to the other cases, all of which are "cataract," there are several interesting features. Cataract itself is a diseased change in the lens of the eye which diminishes its transparency, that is to say, the lens, instead of remaining, as it should, perfectly clear and transparent, becomes more or less whitish or opaque.

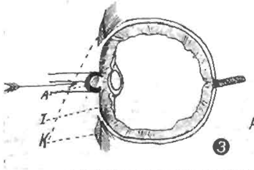


FIG. 3.—VERTICAL SECTION OF EYE IN FOAL. CASE NO. 1.

a. Cornea, corresponding to Fig. 1*a*, opaque, dark coloured, shrunken and protruding. *i*. So-called "white of the eye" prominent, red and fleshy. *k*. Eyelids.

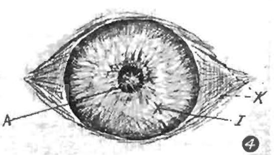


FIG. 4.—FRONT VIEW OF EYE IN FOAL. CASE NO. 1.

a. Cornea. *i*. So-called "white of the eye." *k*. Eyelids, forced apart to expose front of eyeball.

This condition partially or completely prevents the rays of light passing into the eye beyond the lens (compare the horizontal lines passing into the eye in Figs. 1 and 2). The general effect of cataract is partial or complete blindness, according to its extent.

In seeking some explanation for this complaint, existing as it does to a rather unusual extent on practically one property, there is unfortunately very little data to work upon. The prevalence of four distinct cases naturally suggests some common cause. This is by no means easy to determine.

In the first place, cataract is more commonly met with in old animals. Age may therefore have had some influence in cases Nos. 2, 3, and 4, which are 14, 12, and 15 years old respectively. On the other hand, No. 5 is only 4 years old, an unusual age for cataract to appear. Again, Nos. 3 and 4 are full sisters, which suggests the possibility of hereditary influence, and, though No. 5 is not related to the other two, its comparatively early appearance gives some support to the theory of hereditary causation. As neither of these predisposing influences satisfactorily explains its existence, something more in the nature of an exciting or immediate cause must be looked for.

In this direction, particularly little has been learnt. Inspection of the pasture failed to yield anything in the nature of harmful plants, *e.g.*, "Wild Tobacco" or "Paddy Melon," which have been known to cause blindness, and in any case such blindness is due to the nerve and not the lens of the eye being affected as in cataract.

Inquiries from the owner and others as to previously existing inflammatory conditions of the eyes, *e.g.*, ophthalmia, which plays an important part in the production of cataract, resulted in the assertion that nothing of this kind has been observed. In spite of this, however, after a due consideration of all the possible causes, I am inclined to the opinion that it is quite possible these horses did suffer from some inflammatory condition in the interior of the eyes previously, which may have passed away unnoticed because the owners were not familiar with such conditions and also because the mares were mostly running out in the paddocks.

It was quite useless attempting any treatment as, so far as animals are concerned, these conditions are practically incurable.

Both the owners and myself have become extremely interested in these cases, and I am hopeful of being afforded opportunities for observing their progress, with a view to reporting more fully on the matter.

ANSWERS TO CORRESPONDENTS.

The Staff of the Department has been organized to a large extent for the purpose of giving information to farmers. Questions in every branch of agriculture are gladly answered. Write a short letter, giving as full particulars as possible, of your local conditions, and state precisely what it is that you want to know. *All inquiries forwarded to the Editor must be accompanied by the name and address of the writer.* This is very necessary, as sometimes insufficient information is furnished by the inquirer.

SULLA CLOVER.—J.W.S. assumes, from the analyses published in the December, 1910, *Journal*, that Sulla Clover would be valuable as a green manure, &c., for stock food. He proposes to plant some on a portion of his farm where the worn-out sandy soil wants improving, sowing from 1 to 2 cwt. of bonedust and superphosphate with the seed.

Answer.—Sulla Clover is valuable as either green manure or as fodder. Sulla Clover does best in soils containing plenty of lime, and a dressing of lime would probably be wise, in addition to the bonedust and superphosphate proposed.

NEW ZEALAND BLACK OATS.—W.H.T. *inquires re* New Zealand black oats.

Answer.—New Zealand black oats are heavy yielders in suitable soils and climates. They require a good rainfall and are useful for fodder and grain, yielding up to 100 bushels per acre. They are sown in early winter and ripen about the middle of December in cool districts. They thrive best in a rich sandy loam.

THOUSAND HEADED KALE.—H.H.S. writes:—"I have a field of thousand headed kale that I have fed off, leaving the stalks still in the ground. If I leave them until next season, will they grow again and be as good as new plants?"

Answer.—If they have not been allowed to seed, the plants will grow again, but will not yield as heavily as freshly grown plants from new seed.

HARROWS FOR WORKING LUCERNE.—A.J.B. asks what kind of disc harrows is most suitable for cultivating lucerne in sandy soil.

Answer.—A tooth disc harrows with diamond pointed teeth.

INSECTS ON WATTLES.—H.C. forwards specimens of insects that are on the trees in his wattle plantation.

Answer.—The wattles are attacked by two kinds of insects, viz., the Wattle Thrips and the Wattle Pinara. A good spraying with Benzole emulsion will soon rid the trees of these pests.

ONION EEL-WORM.—A.F.B. asks whether onion seed from a district where eel-worm is prevalent is likely to be infected. He also makes inquiry regarding the habits of the onion eel-worm.

Answer.—Onion seeds obtained from a district badly infested with the onion eel-worm (*Tylenchus devastatrix*) have been extensively grown in sterilized soil by this Department, and in no case was there any infection of the plants. If the seed from an infected district is dusty, it is possible there may be eggs in the dust, and clean ground become infected in this way. In purchasing seed, see that it is free from dust. The life history and habits of the onion eel-worm were dealt with in the March, 1910, *Journal*.

PLANTS FOR IDENTIFICATION.—E.B. and M.W.W. forward specimens for identification. E.B. asks whether the plant forwarded has any medicinal properties. It has been recommended as a cure for rheumatism.

Answer.—(1) E.B.—*Plantago coronopus*, L., Buckshorn Plantain. Though allied to the Ribwort Plantain, it has practically no fodder value. It is native to Europe, Asia, and Australia, is very variable in size, seeding freely and usually growing on dry sandy or stony situations, especially near the sea. It is an indicator of poor soil. Manuring by encouraging taller and useful vegetation does much to suppress it. Irrigation has the same effect, and, to a certain extent, also merely scarifying the surface. It was formerly regarded as a remedy for hydrophobia. The young leaves have a diuretic action, and this by aiding in the removal of uric acid from the blood might help to remove some symptoms, generally considered to be rheumatic in character. It would not, however, be advisable to use the plant for rheumatism without previously seeking the advice of a medical man. The young leaves are sometimes used in salads, for which purpose the plant is often grown in European gardens, especially in Greece; but, under ordinary circumstances, it is nothing but a weed.

(2) M.W.W.—The specimen was somewhat damaged, but is *Oxalis cernua*, Thunb., South African Wood-sorrel. It is a troublesome weed, particularly in sour land rich in humus. Aeration, drainage, liming, good cultivation and rotation farming all aid in suppressing it. Direct eradication by poisons and hand methods is impossible on a large scale. The land is best cleaned by ploughing, fallowing, and stirring for a year, especially during the early portion of the season, when the plant is growing and flowering most actively. By that time, the seeds and perennial parts will be largely exhausted; after that, the great thing is to keep the ground well covered with a leafy crop, and the soil open and well stirred. The land should not be seeded down in grass again until quite clean, and care should be taken to use pure seed. In gardens, lime heavily (2 to 5 tons per acre) and keep the ground well stirred and frequently hoed, raking out the larger bulbs.

FERMENTING VAT.—G.H.H. asks whether there is any preparation with which he could paint the inside of a galvanized iron tank, or a plain iron tank, so that it could be used as fermenting vat.

Answer.—Several proprietary compositions are on the market for coating the inside of casks, &c. It is, however, considered very undesirable to ferment in an iron vessel so treated, the coating being liable to be easily removed and the metal, where exposed, is attacked by the acids of the wine. Galvanized iron, owing to its coating of zinc, is particularly undesirable.

ALMOND STOCKS.—A.J. asks why the almond grafted on plum stocks is not recommended.

Answer.—Generally speaking, fruits do better when worked on their own wood, owing to closeness of affinity. For that reason the almond in some districts does even better on the peach stock than on its own, the almond and the peach being very closely related. Owing to the very distant relationship between the plum and the almond, the latter is not generally recommended as a stock. At the same time, in some districts and situations, this combination gives very good results.

Almonds.—E.A.W. asks for names of soft-shelled almonds. He also asks whether trees will bear sweet almonds if grown from nuts.

Answer.—Brandes Jordan, Early Jordan, and I.X.L. *Trees may bear sweet* almonds if grown from the nut, but the shell will be always hard.

Non-bearing Apple Tree.—E.A.W. states that a Northern Spy apple on blight-proof stock, although 12 years old, has not yet borne fruit. It is apparently healthy.

Answer.—Northern Spy apple trees are always a long *time coming into* bearing, as a rule never showing any fruit until from 7 to 10 years old. If the tree has been heavily pruned each year, or if the leaders have been allowed to grow too upright, the tree would be thrown out of bearing. Prune the tree very lightly; take out any central upright growths, and do not feed or manure heavily.

STATISTICS.

Rainfall in Victoria.

Third Quarter, 1911.

Table showing average amount of rainfall in each of the 26 Basins or Regions constituting the State of Victoria for each month and the quarter, with the corresponding monthly and quarterly averages for each Basin, deduced from all available records to date.

Basin or District.	July.		August.		September.		Quarter.	
	Amount, 1911.	Average.	Amount, 1911.	Average.	Amount, 1911.	Average.	Amount, 1911.	Average.
	inches.	inches.	inches.	inches	inches.	inches	inches	inches.
Glenelg and Wannon Rivers	2·74	3·46	1·19	3·12	3·49	2·91	7·42	9·49
Fitzroy, Eumeralla, and Merri Rivers	3·10	3·77	1·35	3·33	3·53	3·08	7·98	10·18
Hopkins River and Mount Emu Creek	2·08	2·52	1·34	2·64	4·22	2·64	7·64	7·80
Mount Elephant and Lake Corangamite	1·83	2·42	1·17	2·51	4·58	2·58	7·58	7·51
Cape Otway Forest ...	3·48	4·11	2·46	4·11	5·34	3·80	11·28	12·02
Moorabool and Barwon Rivers	1·91	2·32	1·20	2·52	5·42	2·53	8·53	7·37
Werribee and Saltwater Rivers	1·60	1·96	1·04	2·17	4·25	2·36	6·89	6·49
Yarra River and Dandenong Creek	3·23	3·15	1·58	3·09	3·18	3·33	7·99	9·57
Koo-wee-rup Swamp ...	3·20	3·10	1·46	3·30	3·28	3·50	7·94	9·90
South Gippsland	2·37	3·79	2·25	3·91	4·05	4·07	8·67	11·77
Latrobe and Thomson Rivers	3·22	3·13	1·82	3·48	3·23	3·79	8·27	10·40
Macallister and Avon Rivers	1·68	1·45	1·13	2·24	2·19	2·02	5·00	5·71
Mitchell River	2·88	2·14	0·89	2·09	3·21	2·61	6·98	6·84
Tambo and Nicholson Rivers	2·80	1·89	0·84	1·86	4·13	2·26	7·77	6·01
Snowy River	3·55	2·83	1·16	2·49	5·95	3·10	10·66	8·42
Murray River	1·69	2·09	0·74	1·95	1·38	1·86	3·81	5·90
Mitta Mitta and Kiewa Rivers	3·63	4·39	1·37	5·34	2·25	3·15	7·25	10·88
Ovens River	3·24	4·64	1·54	3·50	2·05	3·33	6·83	11·47
Goulburn River	2·40	2·95	1·09	2·64	2·05	2·47	5.54	8·06
Campaspe River	1·82	2·72	1·07	2·53	2·48	2·58	5·37	7·83
Loddon River	1·40	1·92	0·82	2·00	2·95	1·77	5·17	5·69
Avon and Richardson Rivers	1·44	1·60	0·60	1·80	3·47	1·59	5·51	4·99
Avoca River	1·19	1·92	0·59	1·87	3·19	1·60	4·97	5·39
Eastern Wimmera	1·98	2·46	1·03	2·55	3·98	2·16	6·99	7·17
Western Wimmera	1·90	2·50	0·92	2·20	1·87	2·06	4·69	6·76
Mallee District	0·95	1·41	0.52	1·46	2·46	1·37	3·93	4·24
The whole State	2·11	2·53	1·06	2·43	3.11	2·38	6·28	7·34

H. A. HUNT,
Commonwealth Meteorologist.

Perishable and Frozen Produce.

Description of Produce.		Exports from State (Oversea).		Deliveries from Government Cool Stores.	
		Quarter ended 30.9.1911.	Quarter ended 30.9.1910.	Quarter ended 30.9.1911.	Quarter ended 30.9.1910.
Butter	lbs.	4,823,228	4,919,760	5,148,752	3,752,392
Milk and Cream ...	cases	360	481	20	80
Cheese	lbs.	11,520	5,040	14,210	23,320
Ham and Bacon ..	"	28,560	10,080	...	..
Poultry	head	10,065	1,630	2,658	2,385
Eggs...	dozen	...	60	4,375	6,520
Mutton and Lamb	carcases	162,844	69,038	19,789	3,440
Beef	quarters	2,600	4,502	...	..
Veal	carcases	381	932	53	194
Pork...	"	1,009	11	1,476	105½
Rabbits and Hares ...	pairs	909,390	991,056	198,545	140,091
Sundries	lbs.	...	...	14,010	60,664

R. CROWE, *Superintendent of Exports.*

Fruit, Plants, Bulbs, Grain, &c.

Goods.	Imports.		Exports.	Goods.	Imports.		Exports.
	Inter-State.	Oversea.	Oversea.		Inter-State.	Oversea.	Oversea.
Apples	4,755	1	1,833	Logs .. .	1,502	12,903	—
Apples, Custard ..	29	—	—	Mace	—	102	—
Bananas, bunches .	3,109	59,271	—	Maize	913	32	—
Bananas, cases ..	1,678	15,668	—	Melons	—	—	7
Barley	3,022	2,835	—	Nutmegs ...	—	355	—
Beans	44	605	—	Nuts	246	2,638	—
Bulbs	1	27	—	Oats	6,317	7	—
Chillies	—	154	—	Onions	—	1	55
Cocoa beans ...	21	1,485	—	Oranges	158,571	—	849
Cocoanuts ...	36	1,019	—	Passion	2,171	—	11
Coffee beans ...	—	1,465	—	Paw Paws ...	65	—	—
Copra ...	—	133	—	Pears	2	—	119
Cucumbers ...	109	—	—	Pepper	—	471	—
Dates	130	—	—	Peas, Dried ..	2,873	3	—
Figs . ..	—	111	—	Pineapples .	16,075	—	266
Fruit—				Plants ...	373	686	334
Canned ...	—	—	2,005	Potatoes ...	104	—	454
Dried ...	—	70	1,738	Rice	9,294	4,133	—
Mixed ...	113	13	—	Seeds	1,025	4,789	683
Green ginger ...	102	53	—	Spice	—	126	—
Hops	—	164	—	Strawberries ...	42	—	—
Jams, Sauces, &c. .	—	—	1,111	Tomatoes ...	1,781	1	—
Lemons ...	8,229	—	1,871	Vegetables ...	14,525	448	4
Linseed ...	11	476	—	Wheat	—	2	—
Loquats .	72	—	—	Yams	170	1	—
Totals ...	21,461	83,550	8,558	Grand Totals ...	237,510	110,338	11,340

Total number of packages inspected for quarter ending 30th September, 1911 = **359,188.**

J. G. TURNER, *Chief Horticultural Officer.*

13 JUN 1928

REMINDERS FOR JANUARY.

LIVE STOCK.

Horses.—*Stabled.*—Over-stimulating and fattening foods should be restricted. Water should be allowed at frequent intervals. Rub down on coming into stables in an overheated condition. Supply a ration of greenstuff to all horses. *Brood mares* should be well fed on succulent food if available: otherwise, oats and bran should be given. *Foals* may with advantage be given oats to the extent of 1 lb. for each month of age daily. Provision should be made for shade shelter for paddocked horses.

Cattle.—Provide supply of succulent fodder, clean water, and shade shelter.

Pigs.—*Sows.*—Supply those farrowing with plenty of short bedding in well-ventilated sties. Those with litters old enough may be turned into grass run. *All* pigs should be given a plentiful supply of clean water.

Sheep.—Disturb sheep as little as possible during hot spells. Remember, rams work mostly in the cool of the day, and crossbred ewes are only now coming in season. The older the feed becomes the greater the necessity for salt in northern areas; in wormy country it should be available at all times. If the least sign of worms exists, commence drenching weaners at once, and enable them to become strong before winter. Salt, 2 cwt.; Stockholm tar, 2 pints; and powdered resin, 1 pint (or 1 lb.); is a useful lick for young lambs in wormy areas.

Poultry.—Separate the sexes; the cockerels should now be fattened and marketed. Grade the young stock according to age and size, otherwise the younger birds will not thrive. Avoid overcrowding. Do not force pullets too much with animal food; build them up with a good variety of food, but avoid maize, and give but little meat.

CULTIVATION.

Farm.—Get all crops harvested and stacked as soon as possible. Horse-hoe maize, potatoes and other summer crops. See to insurance of stacks of grain and hay.

Orchard.—Keep the soil well scarified and weed free. Cultivate after irrigation or rain. Do not allow the surface to become caked. Spray against codlin moth, pear slug, vine caterpillar, and woolly aphis. Summer prune strong growing shoots and laterals.

Vegetable Garden.—Plant out all seedlings when ready, from former sowings. Stir and mulch the surface. Dig each plot as it becomes vacant. Sow seeds of cauliflower, cabbage, peas, French beans, Kohl Rabi, &c.

Flower Garden.—Keep the soil moist and cool by watering, hoeing, and mulching. Stake tender and lengthy plants. Water and shade young plants. Sow pansy, Iceland poppy, cosmos, aster, &c.

Vineyard.—This is the slackest month in un-irrigated vineyards—all ordinary work should be completed before Christmas. It is only exceptional operations, such as scarifying after rain or sulphuring in case of oidium, that must be carried out. In irrigated vineyards the application of water, and the cultivation it necessitates, must receive attention.

Cellar.—Fill up regularly and keep cellar as cool as possible. Towards end of month commence to make preparations for the coming vintage.

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The Index of Vol. IX. will be supplied with the first number of Vol. X., viz., 10th January, 1912.